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BY

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PREFACE.

MANY years have elapsed since the first appearance of the Obstetric Treatises, by Profs. Meigs, Hodge, and Bedford; and the more recent editions of their works have not kept pace with the progress of this branch of medicine. To supply the deficiency, the American Medical Schools have been furnished with Obstetric Text Books from Great Britain and Continental Europe; chiefly by reprints of the works of Playfair and Leishman, and translations of those of Cazeaux and Schroeder. Believing that there is a demand for a work which shall more thoroughly represent American Obstetric Practice, the author has ventured to present the following condensed treatise to the medical students and practitioners of his own country.

Many years' experience as a practitioner, and several as teacher of midwifery, lead him to hope that he may at least assist in supplying the demand for a book properly representing the peculiarities of American practice, and adapted to the wants of obstetric teachers and busy practitioners.

He is under many obligations to Messrs. H. C. Lea's Son & Co., Lindsay & Blakiston, Tiemann, and others, for the use of illustrations, obtained chiefly from the works of Cazeaux, Meadows, Playfair, Leishman, Churchill, and Hodge.

Expecting to be absent in Europe during the publication of his

work, the author has confided its editorial supervision to a friend, the well-known medical writer and editor, Dr. Robert P. Harris, of Philadelphia, in whose hands he leaves his manuscript, and whom he thanks in advance, with confidence, for the contemplated assistance.

RODNEY GLISAN, M.D.

PORTLAND, OREGON,
June, 1881.

EDITOR'S NOTICE.

HAVING at the author's request consented to act in his stead in supervising the publication of his work, I wish it to be understood that I have not taken advantage of the full powers conferred upon me; but have preferred to leave the composition and its orthography as nearly intact as possible, only making such changes as have been rendered necessary, by very recent additions to obstetric science, and these are but few in number.

After a very long interval, in which no American obstetric works were written except that of Dr. Byford, Professor Glisan, who is chiefly known in our Eastern cities as a contributor to the "American Journal of the Medical Sciences," presents an additional work. It will be noticed by the reader of his book, that his remote position in America has not prevented him from being well posted upon all that is new in his particular branch of medical science. An Eastern graduate, located in the extreme West, after eleven years of army medical service, Dr. Glisan became an obstetric practitioner and teacher in California and Oregon, where a long experience has enabled him to obtain that practical knowledge which gives a character and value to many portions of his work.

R. P. H.

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ON MIDWIFERY.

CHAPTER I.

ANATOMY OF THE PELVIS.

HISTORY OF MIDWIFERY.—In the following pages I shall endeavor to avoid, as much as possible, mere theories and hypotheses, and will strive to inculcate only the most useful and practical precepts and principles appertaining to the Obstetric Art.

A history of this highly important branch of medicine would doubtless prove both interesting and instructive to many readers, but as a complete understanding of the various vicissitudes through which it has passed would exhaust more than a fair proportion of the space allotted for the discussion of the many questions demanding attention, I shall barely glance at a few points connected therewith.

In ancient times, and until about two hundred years ago, the practice of midwifery, in its then crude condition, was almost monopolized by women. As medicine and surgery began to be scientific and influential, midwives saw the necessity of seeking the counsel and assistance of educated physicians and surgeons. It finally became the custom among the most enlightened nations, especially Great Britain and the United States, as it is at the present day, to employ men, almost to the exclusion of women, in the practice of obstetrics.

The present seems to be a transitional period, when women are again demanding the right to attend their own sex in the hour of their greatest tribulation. If they will educate themselves for this duty, as many of them are doing, there is no reason why they should not be permitted to make a trial of their ability to compete with men in this and all other branches of the healing art. However well they may succeed in ordinary obstetrical practice, it is

highly probable that they will never supplant the sterner sex in operative midwifery, nor in the surgical treatment of the diseases of women. I am here reminded that, as obstetrics, especially operative obstetrics, was gradually advanced into a science, and was taken from the hands of females, it became at first mainly associated with surgery as a kind of adjunct, and was not deemed of equal honor with the other branches of medicine. It was considered a part of surgery until the middle of the last century, when, under the labors of such men as M. Levret, in France, and Dr. Smellie, in England, it commenced a rapid and independent advancement, and was soon recognized as second in importance and honor to no other branch of medicine.

In the United States obstetrics did not gain an independent footing until the beginning of the present century.

The first professor of obstetrics in the time-honored University of Pennsylvania was Dr. Thomas C. James, who was appointed to fill that chair in 1810; but it was left optional with students to attend lectures in that branch until 1813, when it was rendered a necessary part of the medical course, and its professorship was raised to an equal rank with the other medical chairs. It is said that the attention of intellectual and scientific men was first attracted to the study of the phenomena of parturition about four hundred years before the Christian era, and that Hippocrates, himself, laid down many rules to guide the practitioner in the art of midwifery. He has been called the father of medicine, and his writings governed the medical world for nearly two thousand years. Although many of his precepts and rules were useful to the midwife, one of his aphorisms caused such a fearful destruction to fœtal and maternal life for so many centuries that it is doubtful whether his investigations in relation to the mechanism of childbirth were in the aggregate beneficial or otherwise to the human race. I allude to his doctrine that the head is the only natural presentation, and that when the child either lies across the pelvis, or presents by the lower extremities, the woman cannot be delivered. Owing to this dogma, operative midwifery was brought into use to convert all transverse, footling, and breast presentations into those of the head. Notwithstanding that Aristotle and Celsus proved the falsity of this aphorism, it continued, owing to the popularity of its distinguished author, to be the ruling doctrine for many centuries.

Changes in Practice within Twenty Years.—The last twenty years have witnessed a revolution in many of the time-honored principles of medicine in general, and especially in the department of obstetrics. While I shall not be in haste to reject everything that is old for the sake of being considered an advanced teacher, I will unhesitatingly recommend all new modes of practice that prove by experience their superiority to the cherished methods of bygone ages.

Stability Recommended.—But allow me, once for all, to recommend to the reader a proper degree of stability in the study and practice of obstetrics, and to caution him against either a hasty acceptance, or rejection, of the many thousand new things and ideas that will, in course of time, present themselves for his consideration. There are many persons of so conservative a turn of mind that they will reject all innovations upon their fixed notions of practice, and as many more, who will change their opinions, as the ladies change their toilet, or as the weather-cock veers with the variable moods of the winds.

Common Sense.—I hope that the reader will belong to neither of these classes, but that he will mingle a due proportion of common sense with his scientific acquirements, so as to be able to choose the few golden grains of facts that lie hidden and commingled with mountains of the common sand of theories and hypotheses. It is better to possess this quality than that more brilliant one, called genius, for the latter, unaccompanied by the former, too often exerts itself in vain, while the former wins success, even when unassisted by the dazzling light of genius.

All persons need common sense, from the humblest laborer in our streets, to the president of our great republic, but none more than the obstetrician.

Pelvis.—But I shall take for granted that my readers possess this useful quality in abundance, and will proceed to the consideration of the foundation study in obstetrical science,—the anatomy of the female pelvis. One will never be able to properly comprehend the mechanism of labor until he has become acquainted with the main anatomical features of the human female pelvis. It is said to be the obstetric alphabet, and should be studied well by every one who desires to practice intelligently the art of midwifery. It forms the lower part of the trunk, and rests on

the two femoral bones. It contains the bladder, rectum, and the organs connected with reproduction.

Obliquity of the Pelvis.—When the female skeleton is placed in an upright position, the pelvis forms a marked obliquity to the horizon, so that a perpendicular line represesenting the axis of the trunk strikes, when extended, the symphysis pubis, and forms an acute angle with a line projected through the centre of the plane of the superior strait. This is a very fortunate arrangement for the pregnant woman, for it will be seen that if the axis of the pelvis and that part of the trunk above it were the same, the gravid uterus would have a tendency to fall into the lower pelvis and produce very serious pathological changes, and very frequent premature births; and even when not pregnant the patient would be constantly liable to prolapsus uteri from slight causes.

Bones of the Pelvis.—The adult pelvis is formed of *four bones*, viz., the two *ossa innominata*, the *sacrum*, and the *coccyx*. The former constitute the anterior and lateral boundaries, and the latter two, the posterior part of the pelvic basin. Although the *adult pelvis* has only four bones, the *fœtal pelvis* has *fourteen*. This is owing to the fact that in fœtal life and childhood each *os innominatum* is divided into the *ilium*, the *ischium*, and the *pubis*, which remain separated from each other up to about the sixteenth year; while the *sacrum* is originally composed of five separate pieces, which unite by ossification after the age of puberty; and the *coccyx* generally of four distinct bones, which unite into *one bone* towards the latter part of life.

Non-ossification of the Coccyx until Advanced Life Fortunate.—I may here remark that the non-ossification of the different parts of the coccyx into one bone until advanced life is a very fortunate provision of nature, for considerable space, an inch or more, is gained in parturition by its flexibility.

Ossa Innominata.—The *ossa innominata* form *three-fourths* of the bony walls of the pelvic cavity and constitute the *anterior* and *lateral boundaries* of the same. They are irregular in shape and possess remarkable fanlike expansions of the ilia; and, as already stated, each bone is divisible originally into three distinct parts, the ilium, the pubis, and the ischium. The union of these separate portions at the acetabulum does not usually become ossified until a few years after puberty, thus allowing the pelvis to be

somewhat modified in shape during this early period by the pressure of the various organs contained in its cavity.

The borders and external surface of the os innominatum afford attachment to many muscles, which lend their aid to the process of parturition,—the *abdominal muscles*, for instance, being attached to its crest or superior border, and the *perineal muscles* to the tuberosity of the ischium.

On the anterior extremity of the *crest* of the *ilium* we find the *anterior superior spinous process*, and an inch and three-quarters below it the *anterior inferior spinous process*, and on the posterior

Fig. 1.

Fig. 2.

Fig. 1.—External Surface of the Os innominatum. A. External iliac fossa. B. Crest of the ilium. C. Anterior superior spine of the ilium. D. Anterior inferior spine of the ilium. E. Horizontal branch of the pubis. F. Posterior superior spine of the ilium. G. Posterior inferior spine of the ilium. H. Cotyloid cavity. I. Ischium. K. Sub-pubic or obturator foramen. M. Ischio-pubic ramus. O. Descending branch of the pubis.

Fig. 2.—Internal Surface of the Right Os innominatum. A. Internal iliac fossa. B. Anterior superior spinous process of the ilium. C. Crest of the ilium. D. Posterior superior spinous process of the ilium. E. Posterior inferior spinous process of the ilium. F. Articular surface. G. Spine of the ischium. H. Tuberosity of the ischium. I. Sub-pubic or obturator foramen. K. Ischio-pubic ramus. M. Ilio-pectineal eminence. N. Spine of the pubis.

extremity of the crest, the *posterior superior spinous process*, and 1½ inches below that the *posterior inferior spinous process*. At the junction of the three bones of the os innominatum (Fig. 1), we shall observe a deep *cotyloid cavity* for the reception of the *os femoris*. About midway between the *anterior inferior spinous process* of the ilium and the spine of the os pubis, or more accurately at the junction of the ilium with the pubis a prominence is found called *ilio-pectineal eminence*, a point of some obstetric importance. The junction of the anterior or pubic portion of the ossa innominata by a firm fibro-cartilage is called the *symphysis pubis*.

The *arch of the pubis* under which the child passes in labor is

formed by the descending branch of the pubis, and the ascending portion of the ischium of each os innominatum.

Behind the arch we see the oval *obturator foramen* (Fig. 2), and below that the *tuberosity* of the *ischium*, a little above and behind which is the *spine* of the *ischium* separating the great and *lesser sciatic notches*, and forming attachments for important ligaments. We must also observe the rough auricular cartilaginous surface of the *sacro-iliac junction*, and superior to this the *prominence* to which the powerful ligaments that bind the sacrum and ilium are attached. We will also particularly notice the course of the *ilio-pectineal line*, which runs from the sacro-vertebral prominence obliquely along the inferior border of the iliac fossa, and the horizontal ramus of the os pubis of each side, terminating at the side of the symphysis pubis; as this line defines the *superior strait* or *brim of the pelvis*, and divides the *false* and *true pelvis*, of which we may have something to say hereafter.

SACRUM.—The *sacrum* forms the posterior walls of the pelvis, and lies between the last lumbar vertebra above; and the coccyx

FIG. 3.

FIG. 4.

FIG. 3.—Anterior Surface of the Sacrum. A. Ala or wings of the sacrum. B. Articular processes. C. Anterior sacral foramina. E. Points of attachment of the right pyramidal muscle.

FIG. 4.—Posterior Surface of the Sacrum. A. Ridge formed by the spinous processes. B. Posterior sacral foramina. D. Articular processes.

below, and the ossa innominata laterally. It is a spongy, triangular bone, with its base upwards. It is smooth and concave, anteriorly (Fig. 3), and rough and convex, posteriorly (Fig. 4).

As already stated, the five separate bones of which it was originally composed unite by ossification about the period of puberty, and leave on its internal surface, at the points of union, *four ridges*, the *upper* of these being occasionally mistaken by the accoucheur for the promontory of the sacrum. In man the sacrum is stronger and larger in proportion to relative size than in any other animal, this distinction being particularly apparent in the female. On

either side of both the anterior and posterior surfaces there will be seen *four foramina* for the transmission respectively of the *anterior* and *posterior sacral nerves.* When the trunk is erect the sacrum is directed from above downwards, and from before backwards. At the base it is *four and a half inches wide.*

Its point of juncture with the last lumbar vertebra is called the *promontory of the sacrum*, a point of great importance in parturition, as it is the guide for certain obstetrical measurements, and sometimes renders labor difficult or impossible by an abnormal projection. Anteriorly the sacrum is hollow, forming what is known as the *curve or concavity of the sacrum.*

Coccyx.—I shall next call attention to the coccyx (Fig. 5), or caudal extremity of the human animal. It is composed of three, or generally four, small bones tapering to a point. It owes its

FIG. 5.

Anterior Surface of Coccyx. A. Cornua of the coccyx. B. Apex.

name to a supposed resemblance to the beak of a cuckoo. It articulates with the lower end of the sacrum by an oval cartilaginous surface supplied with a synovial membrane. This articulation is generally movable up to the close of the childbearing period when it becomes anchylosed. The other bones become firmly united at a somewhat earlier period. Cazeaux, however, asserts that the first and second bones of the coccyx become united before the sacro-coccygeal articulation.

Owing to the curving of the coccyx forward it would be a serious impediment to parturition, were it not for its mobility, which allows the antero-posterior diameter of the pelvic outlet to be increased an inch or even more.

Occasionally all the parts of this bone, together with its sacral articulation, become anchylosed in women who are still young, causing thereby increased difficulty in childbirth and resulting, sometimes, in fracture of the bone itself. In the treatment of such a fracture it is important to prevent the fragments from uniting in such a way as to cause future impediment in labor.

Pelvic Articulations.—Having directed attention to the bony framework of the pelvis, we shall next consider what means

nature has made use of to join the individual pieces of the same together, so as to render the structure sufficiently strong for the purposes for which it is intended. Had the human artist been required to bind the various parts together he would doubtless have made use of nails, of screws, of glue or cement, and perhaps bands of metal, and would have failed, after all, in accomplishing both the strength and perfect adaptability necessary for the female pelvis. Nature, in the perfect adaptation of means to ends, is inimitable!

The pelvic bones are, at their points of junction or articulations, firmly bound by ligaments, which are so arranged as to supplement the bones in completing the framework of the pelvis. These ligaments are smooth where smoothness is essential, as on the internal surface of the pelvis, and arranged in larger and rougher masses on the external surface, where strength is the most indispensable. Although the articulations of the pelvis have generally been considered as *amphiarthrodia* or *symphyses*, signifying articulating surfaces bound so firmly together as to prevent *sliding motion*, yet it has been asserted by Lenoir, and many other distinguished authorities, that this is an error, so far as relates to the female pelvis during pregnancy and childbirth; but even they admit that this motion is very slight.

Lumbo-sacral Articulation.—It will be observed that the disk of fibro-cartilage intervening between the last lumbar vertebra and the sacrum is thicker in front than behind. This, and a similar peculiarity of the last lumbar vertebra, help to form the angle made by the sacrum with the rest of the spine. The ligaments which bind this articulation are, for the most part, analogous to those which unite the vertebra above; but there is, besides, a peculiar ligament, the lumbo-sacral, extending from the transverse process of the fifth lumbar vertebra, on each side, and, expanding as it descends, attaching itself to the depressed sides of the base of the sacrum; also a ligament called the *ilio-lumbar*, extending from the transverse process of the last lumbar vertebra to the posterior margin of the fossa of the ilium on each side.

Sacro-Coccygeal Joint.—On examination of the sacro-coccygeal joint, cartilaginous disks will be found analogous to those in the rest of the intervertebral spaces, but much smaller. They are also bound together by anterior and posterior ligaments. In the male, and to a greater extent in the adult female, a synovial mem-

brane exists between the sacrum and coccyx, converting this articulation into a hinge-joint, of great utility in parturient women.

SACRO-ILIAC ARTICULATION.—By the sacro-iliac articulation is meant the union of the lateral surfaces of the sacrum with corresponding surfaces of the ossa ilii. A cartilaginous covering is found on each of the opposing articular surfaces, but it is said to be somewhat thicker on the sacral than the iliac edges. Although the union is generally a firm one, it is asserted by modern observers that the posterior parts of the cartilaginous surfaces are separated by a synovial membrane, which allows, during pregnancy, a slight degree of motion.

As the sacrum is fitted between the iliac bones like a *wedge*, or *keystone* of an *arch*, or, as Dr. Duncan has it, a "*strong transverse beam*," and receives through the vertebral column the weight of the body, it is indispensable that the articulations with the ossa ilii should be strengthened by powerful ligaments. And this we find to be the case.

The most important of these are the posterior sacro-iliac ligaments, consisting of strong, irregular bands of fibres, which pass from the overhanging rough surface of the ilium to the posterior and lateral surfaces of the sacrum.

One of these bands takes the name of the *oblique sacro-iliac ligament*, from the fact of its passing obliquely downwards from the posterior superior iliac spine to the lower part of the sacrum.

It is mainly by these ligaments that the sacrum is prevented from being depressed by the weight of the body, and is enabled to transmit this weight to the sacro-cotyloid beams and the heads of the femoral bones.

In this connection I must also mention two other ligaments, which add to their duty of strengthening the sacro-iliac articulation the offices of completing the walls of the lesser pelvis, and of giving support to the pelvic viscera. I allude to the *lesser* and *greater sacro-ischiatic* ligaments. The former is situated anterior to the latter, and arising from the spinous process of the ischium, gradually widens into a triangle, with its base attached to the sides and back part of the coccyx and sacrum.

The greater, or posterior sacro-ischiatic ligament, arises from the tuberosity of the ischium, and is attached by a broad expansion to the posterior and lateral surfaces of the coccyx and sacrum, and the posterior inferior spine of the ilium. By these two liga-

ments the ischiatic notch is converted into two foramina, the *larger* of which gives transmission to the *great ischiatic nerve*, *pyriformis muscle*, and to the *internal pudic nerves* and *vessels;* while the lesser foramen gives passage to the same kind of nerves and vessels, and to the *internal obturator* muscle.

Symphysis Pubis.—The union of the pubic bones in front by two oval plates of fibro-cartilage, strengthened by ligaments, is called the *symphysis pubis*. The two pubic bones are more widely separated in front than behind by these plates, which are in contact, except at the posterior and superior part of the articulation, where there is a *synovial membrane*, that in pregnancy frequently increases in size. This symphysis is strengthened by the *posterior*, *anterior*, *superior*, and *sub-pubic ligaments*. The latter is the largest, and is so attached to the rami of the pubic bones as to give a roundness and smoothness to the superior boundary of the pubic arch. Among the objects for a cartilaginous, instead of a bony union at the symphysis pubis, may be mentioned, resistance to shock from sudden and severe blows, and a facilitation of parturition by allowing a slight degree of mobility of the joint.

This question of motion, however, has given rise to much discussion, as will be seen further on.

Obturator Foramen.—The *obturator foramen* is almost entirely closed by a fibrous structure called the obturator membrane, which gives attachment both internally and externally to the *obturator muscles*, and exit through a small aperture at its superior margin, to the *obturator nerve* and *vessels*.

It is supposed by Joulin that this membrane, as well as the ischiatic ligaments, by yielding a little to the pressure of the head of the child, lessens somewhat the risk of contusion of the soft parts that would result, if they were compressed between the fœtal head and an entire bony pelvis.

Mobility of Pelvic Articulations.—It was the belief of the medical profession for about two thousand years that the pelvic articulations became relaxed during pregnancy, and that they separated during parturition for the purpose of facilitating the birth of the fœtus. This opinion was controverted for the first time in the sixteenth century, and, until a recent period, the opponents of mobility seemed to be in the ascendant. It is, however, admitted by the best modern authorities that there is in the latter period of gestation a decided thickening, relaxation, and *softening* of the

pelvic symphyses, and a relaxation of the ligaments which bind the latter; and that, as a result of this structural change, there is a limited degree of movement in these articulations, that tends to facilitate the process of parturition.

This mobility is most marked in the symphysis pubis, and in the sacro-iliac articulations. It is thought by Dr. Matthews Duncan, and others, to consist mostly in an elevation and depression of the pubic articulation, as the result either of the ilia moving on the sacrum, or of a movement of the sacrum itself on an imaginary transverse axis passing through it. It is asserted that by these movements the brim of the pelvis is, during the first stage of labor, enlarged one or two lines by a backward movement of the base of the sacrum at the expense of the outlet; and that, in the second stage, the conjugate diameter of the outlet is slightly increased by the tilting back of the lower part of the sacrum and the coccyx, thus lessening at the same time the conjugate diameter of the brim by a corresponding tilting forward of the upper part of the sacrum. The tilting back of the coccyx, here alluded to, must not be confounded with the backward motion permitted to it by its own articulation with the sacrum, but is a slight addition to this universally acknowledged movement, concerning which I have already made allusion.

A General View of the Pelvis.—Having given in detail a description of the female pelvis, we will now take a more general view of this important obstetric framework.

What is a True, and what is a False Pelvis?—The latter is all that portion above the *brim of the pelvis*, and the former, all that *below the brim*. The names, *inferior*, and lesser pelvis, are used synonymously for the true pelvis, and the terms, superior and greater pelvis, for the false pelvis. So, also, the name, superior strait, is given to the brim.

As the superior strait, or brim, not only divides the pelvis into the true and false pelvis, but is otherwise of great obstetric importance, I shall, once for all, define what is meant by it.

It is a heart-shaped opening, bounded by the symphysis pubis in front, the linea ilio-pectinea on the sides, and the sacrum behind.

If the ilio-pectineal line be considered, as it is by most authors, as extending on either side from the top of the symphysis pubis outward, upward, and inward, to the centre of the promontory of

the sacrum, then this line alone may be considered as marking the boundary of the *brim*, *superior strait*, or *inlet of the pelvis*.

As the false pelvis is of little importance in an obstetric point of view, I shall not attempt its description, but will first offer a few remarks on the striking contrast between the male and female pelvis, and afterward describe the true pelvis. The female pelvis is wider, lighter, and less funnel-shaped than that of the male. Owing to a less projection of the promontory of the sacrum, the brim is more oval, and less heart-shaped than in the male pelvis. In fact all the bony projections are less marked, and all the inner surfaces of bones much smoother, than in the opposite sex. The iliac bones are more spread out, thus giving greater breadth to the female pelvis, and the peculiar swinging, waddling, or side to side gait that we perceive in all women.

The spines and tuberosities of the ischia are less prominent, and further apart. The perpendicular depth of the cavity of the pelvis —or that part of its irregularly shaped canal or tube lying between the plane of the brim and that of the outlet—is much less in the female than in the male. That portion of its anterior boundary, for instance, represented by the symphysis pubis is only about two-thirds of the depth of the corresponding part of the male. Its posterior or sacral boundary is shorter, broader, and possesses a greater concavity than the male pelvis.

The most characteristic distinction may perhaps be found in the greater span of the female pubic arch, which ranges from 90° to 100°, while it is only from 75° to 80° in the male.

It is supposed by some eminent authorities that a few of these differences between the male and female pelvis—such as the greater width, the less projection of the promontory of the sacrum, and less depth of the symphysis pubis, and the more oval shape of the brim of the pelvis—are owing to the presence and development of the female genital organs in the true pelvis. They assert that in females who have congenitally defective internal organs, or from whom both ovaries have early in life been removed, the pelvis does not possess in so high a degree its ordinary well-marked characteristic points of distinction from that of the male.

True Pelvis.—A thorough knowledge of the *true*, or *inferior*, *pelvis*, is absolutely necessary to the obstetrician.

As already stated, the linea ilio-pectinea forms the line of demarcation between the false and true pelvis.

The walls of the latter are composed of the *coccyx*, *sacrum*, the *bones* of the *ischia* and *pubes*, the lower portions of the *ilia*, and the *sacro-ischiatic ligaments*.

It presents two openings called *straits*, because they are narrower than the cavity or canal extending from one to the other. The *upper* of these openings is denominated the *superior strait*, the *brim*, the *inlet;* and the *lower* the *inferior*, or *perineal strait*, or *pelvic outlet*.

Its Measurements.—The measurements of the true pelvis may, of course, be made at any opposing points of its circumference, but it has been customary in obstetric works to describe three principal diameters, viz., the *transverse*, the *oblique*, and the *antero-posterior*, which are taken at the *brim*, in the *cavity*, and at the *outlet*. Although the oblique diameter is rarely measured at the latter opening.

Brim (Fig. 6).—The *transverse at the brim* is taken from opposite points midway between the *sacro-iliac symphyses* and the *ilio-pectineal eminences*, and measures five inches. The oblique is taken from the

Fig. 6.

a a. The antero-posterior, or sacro-pubic diameter. *b b*. The transverse diameter. *c c*. The two oblique diameters. *a c*. The sacro-cotyloid interval.

sacro-iliac articulation of each side to an opposing point of the brim at the ilio-pectineal eminence, and measures 4.8 inches.

That one starting from the right sacro-iliac articulation (joint, symphysis, or synchondrosis), is called the right oblique, and that from the left, the left oblique diameter.

In thus naming the oblique diameters, I have followed the custom of Leishman, Playfair, Shroeder, Cazeaux, and other distinguished English, French, and German authors; but Hodge, Bed-

ford, and some eminent French writers, invert the meaning of the terms, by calling what I have named the "right oblique," the "left oblique," and *vice versa*—naming each from the side where it terminates, rather than from the one whence it springs.

The *antero-posterior*, or *conjugate diameter* is taken at the *brim* from the *upper and superior part* of the *symphysis pubis* to the middle of the *promontory of the sacrum*, and measures 4¼ inches.

CAVITY.—The *transverse diameter* of the *cavity* is taken from corresponding opposing points, at the inferior margins of the acetabula, and measures 4¾ inches. The *oblique diameter* extends from the centre of the *great sacro-ischiatic foramen* on one side, to the *foramen ovale* on the other side, and measures 5¼ inches.

Not being taken from bony points, it is variable.

The *antero-posterior diameter* is taken from the centre of the symphysis pubis to the superior margin of the third sacral vertebra, and measures 5 inches.

OUTLET.—The transverse diameter of the outlet measures 4¼ inches, and extends from one to the other tuber ischii.

The *oblique diameter* measures 4¾ inches, and is considered as reaching from the middle of the lower edge of the great sacro-ischiatic ligament on one side, to the ischio-pubic union on the other. Like the oblique diameter of the cavity, it is subject to variation, because not taken from bony points.

The *antero-posterior diameter* of the outlet measures 5 inches, and reaches from the inferior edge of the symphysis pubis to the apex of the coccygeal bone. This diameter may be extended from half an inch to an inch by pressing back the coccyx, during labor.

It is well to bear in mind that these measurements are those of the bony pelvis, and that they are modified by the presence of the soft parts in the living subject.

The *psoas and iliacus muscles*, for instance, lessen the transverse diameter of the brim half an inch, thus making the oblique diameters, which are shorter in the bony pelvis than the transverse diameter, the longest; which is one of the chief reasons why the fœtal head, in presenting at the brim during labor, makes its bony or occipito-frontal diameter correspond with one or the other oblique diameters; generally the right, because the left oblique is always slightly shortened by the presence of the rectum.

When this bowel is distended with fecal matter, the diameter is greatly lessened.

The *conjugate diameter of the brim*, and *all the diameters of the cavity* are diminished by the soft tissues about *a quarter of an inch*. It is also important to bear in mind that the *antero-posterior diameter of the brim* is half an inch less than the distance from the promontory of the sacrum to the inferior edge of the symphysis pubis; so that in measuring this diameter by the finger passed in the usual way, from beneath the symphysis pubis to the promontory of the sacrum, a proper allowance may be made.

External Measurements.—The distance between the anterior superior spinous processes of the iliac bones is 10 inches; the distance from the central points of the crests of the ilia is 10½ inches; from the spinous process of the fifth lumbar vertebra to the superior margin of the symphysis pubis about 7 inches.

In the living body two or three inches must be added to the external measurement of the skeleton just given, on account of the tegumentary and other soft structures. These are the most important external measurements, though the following may be found useful: The distance from the tuberosity of either ischium to the posterior superior iliac spine of the opposite side is 6½ inches; from the trochanter major of each side to the posterior superior spine of the ilium of the opposite side, 8 inches; and from the last lumbar vertebra to the anterior superior spine of either iliac bone, 6¾ inches.

The true internal pelvic diameters cannot be ascertained by external measurements, but the latter are valuable, as will be seen at the proper time, in the diagnosis of deformities of the pelvis, because, when the external diameters indicate the want of a proper proportion among themselves, we know that there must be a deformity somewhere, the true nature of which may be ascertained by following the rules laid down in the chapter on deformities.

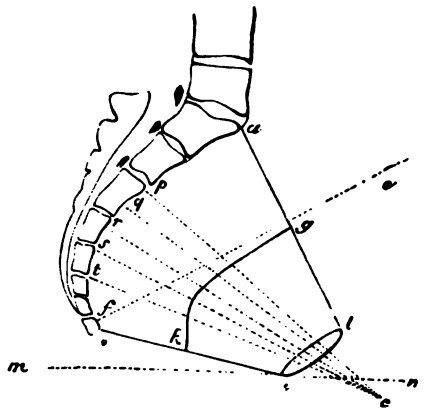
Both the internal and external measurements given above are only averages taken from a large number of pelves. Whilst no two of the latter are exactly alike, yet any pelvis differing widely in its measurements from the average standard thus obtained, cannot be considered as normal.

Planes of the Pelvis (Fig. 7).—These are imaginary levels or surfaces extending across any part of the pelvis, and may be represented as suggested by Lenoir by pieces of cardboard of the proper sizes and configurations placed across the pelvis at the *brim*, the

outlet, or any *intervening portion of the cavity*. These planes are mere mathematical surfaces without depth, but having circumference and forming certain inclinations with each other, and with the horizon, of importance to the accoucheur.

The circumference of the *first plane*, or that of *the brim*, is usually about 13½ inches; and the angle it forms with the horizon is about 60°; while it makes an angle with the spinal column of 150°. The *plane* of the *pelvic outlet* is not easily described, owing to the irregularity of the circumference of the lower strait. But as is generally done, we consider the plane as being parallel with a line drawn from the tip of the coccyx in the usual position, to

FIG. 7.



a b. The plane of the superior strait. *i d*. The plane of the inferior strait. *c*. The point where these two planes would meet, if prolonged. *m n*. The horizontal line. *e f*. The axis of the superior strait. *g k*. The axis of the excavation. *p q r s t*. Various points taken on the sacrum to show the plane of the excavation at each point.

the lowest part of the symphysis pubis. Its angle of inclination with the horizon is about 11°, varying, however, with the movements of the apex of the coccyx itself during parturition. These angles are merely approximative. The inclination of the pelvis with the spinal column varies even in the same female according to the different positions of her body during pregnancy. A horizontal plane touching anteriorly at the upper margin of the symphysis pubis would infringe posteriorly upon the junction of the second and third coccygeal bones, or a point about four inches below the promontory of the sacrum.

THE PLANES OF THE ISCHIUM AND THE INCLINED PLANES OF THE PELVIS.—Besides the planes just described there are others of a

different nature and of great practical importance in parturition. Allusion is made to the planes of the ischium, and the inclined planes of the pelvis. They are not synonymous terms as some might suppose, the latter having a more extended meaning than, and even embracing, the former.

Each ischium is divided into two planes by a line extending from the ilio-pectineal eminence to the spine of the ischium. The one inclining towards the obturator foramen and the sub-pubic arch being known as the anterior or descending plane of the ischium, and the other, inclining towards the greater ischiatic foramen, receiving the name of the posterior or ascending plane of the ischium. Many authors in describing the mechanism of labor allude to the ischial planes, to the exclusion of the following more comprehensive term.

THE INCLINED PLANES OF THE PELVIS.—These are four in number, the left and right anterior inclined planes, and the left and right posterior inclined planes. The boundaries of these are determined by Moreau, Cazeaux, and others, by making four equal vertical sections of the pelvis. But Professor Hodge and others so divide the latter as to make the anterior planes larger than the others. Hodge first divides the pelvis into two lateral halves, and subdivides each of these by a line extending on each side from a point ¾ of an inch anterior to the sacro-iliac synchondrosis of the respective side down through the ischial spine, so as to divide the inferior sacro-sciatic ligament about an inch and a half behind the tuberosity of the ischium. The internal surfaces of these sections form the four planes. According to this division the left anterior inclined plane extends from the symphysis pubis to the line described as passing through the spine of the ischium of the left side, and the left posterior inclined plane embraces the internal surface of that portion of the pelvis lying between this line and the centre of the sacrum and coccyx. The right anterior and posterior inclined planes are formed in the same manner from the right half of the pelvis. The practical use of a knowledge of these planes will be better appreciated after a description in another chapter of the mechanism of labor.

AXIS OF THE PARTURIENT CANAL AND PELVIS.—As the axis of the pelvic canal, or rather the whole parturient canal, represents the course taken by the fœtus during parturition, it should be thoroughly understood by the obstetrician, or he would be unable

to render the proper manual or instrumental assistance when required. The term axis of the parturient canal (Fig. 8), is not synonymous with the phrase, axis of the true bony pelvis, but embraces the latter, together with the axis of the womb above and the soft parts at the outlet of the pelvis.

The "curve of Carus" was formerly supposed to represent the pelvic axis. It is an imaginary arc of a circle formed by a pair of compasses opened 2¼ inches, with one point placed upon the

FIG. 8.

Representing General Axis of Parturient Canal, including the Uterine Cavity and Soft Parts.

centre of the posterior surface of the symphysis pubis, and the other turned around from the plane of the brim to that of the outlet of the pelvis.

Modern observers deny that this axis forms any part of a circle, but affirm it to be an irregular parabolic line formed by the sum of the axis of an indefinite number of planes at various parts of the pelvic canal (Fig. 7).

The axis of any particular plane is simply a perpendicular line drawn through its centre. The axis of the brim of the bony pelvis, for instance, is a line drawn perpendicularly to its plane, and extends from the umbilicus to about the apex of the coccygeal

bone (Fig. 7); the axis of the outlet is a perpendicular line to its plane, and reaches from the promontory of the sacrum to a point midway between the tuberosities of the ischia, intersecting the axis of the brim.

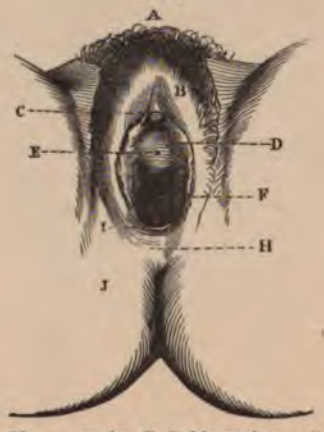
The axis of the cavity of the uterus, when the latter is normal in position, corresponds with the axis of the brim of the pelvis. The axis of the lower part of the parturient canal will vary during labor in accordance with the amount of perineal distension.

CHAPTER II.

THE FEMALE ORGANS OF GENERATION.

THE organs of generation are much more complex in the female than in the male. A general anatomical and physiological description of them, chiefly in reference to conception, gestation, and labor, is all that the obstetric student requires. They may be studied in regard to their functions and situation under the two heads of copulative, or external organs, and formative, or internal organs. The former include the labia externa, the labia interna,

FIG. 9.



External genital parts. A. Mons veneris. B. Labia majora. C. Clitoris. D. Labia minora. E. Orifice of urethra. F. Orifice of vagina. H. Posterior commissure of the vulva. I. Perineum. J. Anus.

the mons veneris, the clitoris, the vestibulum, the meatus urinarius, the urethra, and the vagina (Fig. 9). All these parts, with the exception of the last, are generally comprehended under the name of vulva, although some authors designate them by the general term pudendum. The *labia externa*, *labia majora*, or *labia pudendi*, form two symmetrical folds, lips, or sides to a somewhat longitudinal or elliptical opening of the vulva. In the woman who has never had a child this aperture of the vulva is about 2½ inches long and is longitudinal, but in the one who has borne children it

is elliptical. These lips extend from the centre of the inferior part of the mons veneris at a point termed the superior commissure to the inferior commissure and perineum. They gradually recede from their points of contact at each commissure to just above their middle, where they are somewhat separated. They are thicker in front or above than behind or below. They have an external tegumentary surface covered with hair, and an internal surface lined with mucous membrane which is continuous with the genito-urinary tract.

Just above where the inferior thinner margins of the labia unite to form the posterior or inferior commissure, they throw a small fold of integument—closely resembling mucous membrane, by which name it is known by many—across the pudendal aperture, called the *fourchette*, or frænulum pudendi, which is usually torn in first labors.

The posterior commissure itself is occasionally designated as the *fourchette*, and *vice versa*.

Fossa Navicularis.—An equal confusion arises in regard to the description of the fossa navicularis, which is described by Bedford, Meadows, and Leishman as lying between the *fourchette* and posterior commissure; by Cazeaux as bounded behind by the fourchette, and in front by the convex border of the hymen; by Ramsbotham as being between the hymen and the perineum. I think that it can be more correctly described as a little depression, about half an inch in length, bounded by the labia externa laterally, the posterior or convex border of the hymen in the unmarried in front or above, and the posterior commissure or anterior border of the perineum behind or below. Both it and the fourchette are of but little obstetric importance, except that the latter when absent affords some evidence of the woman having borne a child.

There are numerous sebaceous glands in the labia externa opening both on their cutaneous and mucous surfaces, and secreting in health a lubricating fluid which softens the parts. These glands are said to secrete—under certain morbid conditions—an acrid fluid capable of excoriating the labia and of producing in man symptoms resembling a gonorrhœa. Intervening between the skin and connective tissue of the labia is a purse-shaped sac analogous to the dartos tunic of the scrotum. This sac contains a varying amount of fat and more or less cellular tissue, and is the receptacle occasionally of a hernial protrusion of the ovary; thus

forming an analogy to a similar but normal descent of the testicle into the male scrotum. The labia are susceptible of an enormous distension. In the virgin they lie close together, concealing the rest of the generative organs, but become more or less separated after childbearing, and dwindle away in advanced age so as to let the labia minora project between them.

The *nymphæ*, *labia minora*, or *labia interna*, are situated inside of the labia majora, and consist of two folds of mucous membrane resembling somewhat the comb of a cock. They commence on either side, at about the centre of the mucous surface of the labia majora, and, converging as they approach the clitoris, bifurcate and allow the inferior branches of the bifurcation to be attached to the clitoris, whilst the superior or larger branches unite above it to form its prepuce. As mentioned before, the labia minora are, in the virgin, concealed by the labia majora, but after childbearing and in advanced life and in the infant at birth they project more or less beyond them. Occasionally they become hypertrophied and hang in long folds between the limbs, embarrassing the tyro in obstetrics, and sometimes causing laughable mistakes in diagnosis. The ancient authors called them nymphæ, because they were supposed to regulate the course of the urine.

The structure of the nymphæ consists of trabeculæ of connective tissue, containing muscular fibres. The nymphæ have developed, on their internal surfaces, many sebaceous glands, the secretion of which lubricates the vulva, and prevents adherence of its lips. It is supposed that the chief object of both external and internal labia is to afford an extensive sexual surface, and great dilatability of the pudenda during labor, and to protect the delicate and important structure within their folds.

The Mons Veneris.—Projecting out in modest relief in front of the symphysis pubis, just above the opening of the vulva, is a cushion of adipose and fibrous tissue named by some romantic anatomist the Mons Veneris. It is continuous with the labia externa on either side, and is, after puberty, covered with hair, which is commonly curled, but sometimes straight, more particularly in sterile women. The mons veneris appears to be intended mainly as a guard to protect the pubes from injury during sexual congress.

The *clitoris* is a small erectile tubercle, the analogue of the male penis, having, like the latter, two crura, two corpora caver-

nosa, a suspensory ligament, a prepuce, and, at its point, a soft spongy mass called the glans. It is imperforate, but the urethral canal passes between the two branches of the cavernous body. It is situated just above the lower margin of the symphysis pubis, about half an inch below the superior commissure of the labia externa.

Its arteries are branches of the perineal artery. It, or more particularly its prepuce, is generally believed to be the chief seat of venereal pleasure. When erected it is about as hard as cartilage. Its erection under venereal excitement is mainly brought about by its cavernous arteries emptying their blood directly into its large veins faster than the latter can dispose of it. It is sometimes, in hysterical women, subject to a kind of priapism, or constant erection, at which time there is a difficulty or impossibility of passing urine.

This organ is so prominent in the embryo that, in cases of abortion before the third month, it is impossible to differentiate the sexes. It is, comparatively, larger in the infant than the adult, its normal projection in the latter being about one-eighth of an inch; but it is subject to great increase in size from hypertrophy, occasionally becoming two inches long. There is one case on record where the clitoris is reported to have been nearly five inches in length.

The *vestibule* is a grooved triangular space, bounded on either side by the diverging folds of the nymphæ, and at its apex by the clitoris, and at its base by the upper edge of the vaginal opening; or, according to some authors, by the *meatus urinarius*, or external opening of the urethra. The *latter* is about an inch below the clitoris, and forms a slight prominence which can be readily made out by the finger when it becomes necessary to pass the catheter, which operation should always, when possible, be done without exposure of the patient.

The *orifice of the urethra* may be found by passing one finger against the upper margin of the vagina, and feeling with a finger of the other hand just above this for the urethral prominence; or, better still, by drawing one finger gently along the vestibule from above downward, until the prominence is reached, when the catheter can be passed by the other hand. Many varieties of catheters are used for this purpose, from Sims's *sigmoid* down to the *common female catheter;* but, during the latter months of pregnancy, and

especially at the period of parturition, the male elastic catheter is the best, because the urethra is then apt to be curved out of its usual course, and more or less elongated.

The normal length of the *urethra* is about one inch and a half. This canal lies just beneath the arch of the pubis, and close to the superior vaginal wall, through which it may be felt. This fact is of practical importance in catheterism, and in all efforts for the prevention of urethro-vaginal fistula. The great dilatability of the urethra should also be borne in mind in connection with operations on the female bladder, especially in the removal of calculi.

Immediately below or behind the *meatus* is the *orifice of the vagina*, which, in the undistended condition is small and slightly oval in virgins, and larger and more of a vertical fissure in women who have had sexual intercourse, or who have borne children. It is capable of enormous distension, particularly during labor. In virgins it is usually more or less closed, especially at its lowest part, by a membranous fold called the hymen. The presence of an unruptured hymen was, in ancient times, considered a proof of *virginity*, and its *rupture* or *absence* a *sign* of *sexual intercourse*. This uncertain test has doubtless caused much heartrending and innocent suffering. It has long been known that rupture of this membrane is the result of many causes besides coition, and that it is so fragile in some cases as to be torn merely by the stretching apart of the lower extremities in romping or jumping, and that, on the contrary, it is sometimes so strong as to prevent complete sexual intercourse. In a few women it becomes simply distended or unfolded, instead of being torn, even after perfect and frequent cohabitation. An unruptured hymen is, occasionally, so great an obstruction to labor as to require incision. Although commonly crescent-shaped, with the concavity upwards, it assumes a variety of forms, and may present only one or two, or numerous openings, or may not be perforated at all, thus rendering an operation necessary for the exit of the menses. Its incision is sometimes required, even when there is no obstruction to the courses, as where the opening is too small and the membrane too resistant for sexual intercourse. The newly married man, however, generally manages to get along under these circumstances without surgical assistance.

Situated around the vaginal orifice are a few—rarely over five—small fleshy tubercles, called *Caruncul*æ *Myrtiformes*, which are generally believed to be remnants of the ruptured hymen; but this

belief is called in question, as these small bodies have been found along with a perfect hymen.

There is on either side of the vagina a plexus (of convoluted veins) called the bulb of the vestibule (Fig. 10), which in its distended condition is supposed to resemble a leech full of blood. It is about an inch in length and is connected with a crus of the clitoris. The orifice of the vagina, as well as all other parts of the vulva, is abundantly supplied with erectile tissue, or venous plexuses, besides the leechlike masses just described. The blood

FIG. 10.

External Organs Partially Dissected.—(Kobelt.)

for these erectile tissues is derived from the internal pudic arteries, and is emptied into the hypogastric veins. Under sexual excitement the constrictor vagina and ischio-cavernous muscles contract upon the different veins of the vagina and other parts of the vulva, and cause an erection of their erectile tissue.

The *Vagina* is a highly dilatable membranous canal, which forms a communication between the vulva and internal generative organs, through which the menses are discharged, the semen admitted to the uterus, and the fœtus expelled. Its direction is an irregular curve with the concavity looking upwards, corresponding somewhat to the axis of the middle and lower part of the true pelvis in which it is situated. It varies considerably in dimensions, and in the adult averages about five inches in length and one inch wide. Its anterior is about an inch and a half shorter than its posterior wall. It is more or less conoidal in shape, having the

apex of the cone at the vulva, where it is constricted by the constrictor vaginal muscle, and widest a little beyond the middle, where the os uteri is inserted; although when not distended its anterior and posterior walls lie in contact. Its anterior wall is the thickest part of the canal, and is intimately connected with the bladder and the urethra; hence, the reason why in uterine displacements the bladder is also dragged out of its normal position. It is connected less closely with the pelvic fascia and broad ligaments on the sides, the rectum behind, and superiorly with the lower part of the uterus, and with a fold of peritoneum both in front and behind (Fig. 11).

The latter fold is known as *Douglas's Pouch*, or *cul-de-sac*, and is of gynæcological importance as the place where a displaced

FIG. 11.

Showing the Relative Position of the Pelvic Organs.

ovary, or the prolapsed small intestines, or a bloody tumor, may be found. It is also called the recto-vaginal pouch, and lies outside and behind the superior part of the posterior wall of the vagina, but must not be confounded with the vaginal cul de-sac on the inside of the vagina, and formed by the termination of the

latter above and behind the cervix uteri. It is important for the obstetrician to bear in mind that the relations of the anterior and posterior walls of the vagina respectively with the urethra and bladder in front, and the rectum behind, are also of great gynæcological interest as the places where, from undue pressure of the child's head in parturition, or of the forceps, or from injuries or diseases, inflammation and perforation of the septum may take place, with the resultant urethro-vaginal, vesico-vaginal, or recto-vaginal fistula.

The celebrated Dr. Marion Sims gained his world-wide reputation in the beginning of his medical career from his method of operating in vesico-vaginal fistula.

The vagina is composed of muscular, cellular, and mucous coats, the latter being thrown into numerous folds which run at right angles or somewhat obliquely from two ridges or raphis termed the columnæ rugarum, one along the anterior and the other along the posterior wall. These lateral folds, or rugæ, are very numerous in the young and unmarried, and become atrophied after child-bearing and in advanced life, but never entirely disappear. Nature doubtless not only intended the rugæ as a provision for the distension of the vagina during labor, but also to yield an extensive surface for sensation during the sexual act.

When the projecting inferior part of the urethra is covered with this rugosity of the mucous membrane in a marked form, as is sometimes the case, especially in women who have had children, the projection is called the "*valva-vaginæ*." When engorged with blood it fills up the vaginal opening and may be mistaken for a prolapse of the vagina or a tumor.

The mucous membrane is lined with tessellated epithelium, and is covered with numerous highly vascular papillæ.

Although the *vaginal orifice*, as well as other parts of the vulva, is surrounded with glands, the canal itself is supposed by late authorities to be destitute of them. Dr. H. L. Hodge, however, and many other eminent authors, do not concur in this opinion. The thickness of the muscular tissue of the vagina is increased during pregnancy. The bloodvessels are arranged in peculiar networks around the vaginal walls so as to form an erectile tissue. This is particularly observable at the inferior extremity of the vagina.

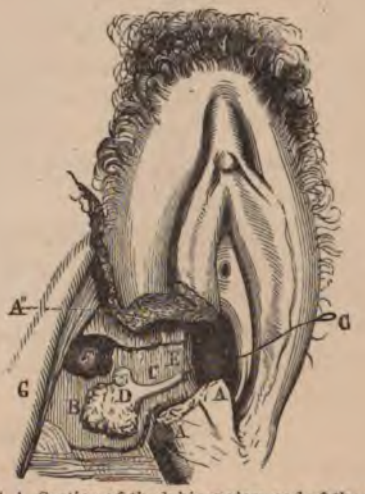
It has been doubted by most authorities that the vagina has

any active contractility by virtue of its muscular tissue; but the practitioner cannot fail to perceive more or less contraction over the end of the speculum as it is being withdrawn, especially in women who have had no children, and decidedly so in those afflicted with an irritable vagina.

The vaginal tube is well supplied with nerves, especially at its lower portion, where there is a peculiar and marked sensibility. Its organic nerves are derived from the hypogastric plexus and its animal nerves from the sacral plexus.

VULVO-VAGINAL GLANDS.—The external organs of generation are abundantly supplied with various kinds of glands, which may be divided into the muciparous and sebaceous. The latter are found in great abundance in the clitoris, in the nymphæ, and other parts of the vulva. They secrete an oily fluid which prevents the parts

FIG. 12.



Vulvo-vaginal Gland. A A. Section of the labia majora and of the nymphæ, showing the excretory duct and its orifice. B. The gland. C. Excretory duct. C'. Stilet engaged in the orifice of the excretory duct. D. Its glandular extremity. E. Its vulvar extremity and orifice. F. Bulb of the vagina. G. Ascending ramus of the ischium.

from adhering, and maintains their sensibility and elasticity; and, what is more important, guards them from the irritating action of the urine.

The *muciparous glands* are generally found in groups, and differ from the sebaceous in their situation and in their secretions. One of these groups is situated in the mucous membrane of the vestibule, and two of them near the meatus urinarius. Under this class are two conglomerate or compound glands found in the

vicinity of the orifice of the vagina, one on each side, under the superficial fascia of the perineum, known as vulvo-vaginal *glands;* which are enveloped in a cellular fibrous tissue, and vary in size from that of a bean to a small almond, and are shaped like the latter (Fig. 12). They consist of a number of lobules separated from each other by cellular fibrous partitions, continuous with the external covering.

The ducts from these lobules form by their union two canals or ducts, about half an inch long, one on each side, which terminate within the labia in front of, or external to, the hymen or carunculæ myrtiformes. These glands are the analogues of Cowper's in the male, and secrete a fluid somewhat similar to the secretion of the prostate glands of the male. This secretion is expelled in jets during the sexual orgasm and facilitates coition. The parts are also lubricated by it during labor. At other times it helps by its moisture to preserve the sensibility of the vulva. The amount of secretion is greatly increased by lascivious dreams, thoughts, contacts, and intercourse. Huguier having constantly found the largest gland on the same side as the largest ovary, naturally inferred that there must be some relation between them. These glands are sometimes the seats of abscesses from obstruction of their ducts.

The *Perineum* is the name given to the space bounded by the anus behind and the posterior commissure of the vulva in front and the rami and tuberosities of the ischia on the sides; and is usually about an inch and a half in length. It is mainly composed of highly distensible cellular tissue, which becomes greatly distended during parturition. When decidedly rigid or unyielding it may retard delivery or be ruptured. What has just been described as the perineum some authors denominate as the anterior perineum, and give the name of posterior perineum to that part of the floor of the pelvis lying between the anus in front, the sacro-sciatic ligaments laterally, and the coccyx behind. Both the anterior and posterior perinea aid in support of the internal pelvic organs from below, and form what is sometimes termed the floor of the pelvis.

The Formative or Internal Organs of Generation.—These consist of the uterus, the Fallopian tubes, and ovaries. It is necessary to study in connection with them the round and broad ligaments and other structures which assist in holding these organs in position (Fig. 13).

The *uterus* in the adult female, when unimpregnated, is deeply situated within the true pelvis, having the bladder in front, the rectum behind, the upper extremity of the vagina below, and the small intestines above. In shape it resembles a pear flattened from before backwards, and consists of a *fundus*, a *body*, and a *cervix* or neck.

FIG. 13.

The *fundus* is that part of the uterus above a transverse line drawn from one to the other opening of the Fallopian tubes into the womb (Fig. 14). The *body* lies between the Fallopian tubes above and the upper part of the neck below. It is mainly in its cavity (Fig. 14) that the impregnated ovum finds a lodgment and fœtal development.

FIG. 14.

Cavity of the Uterus and the Fallopian Tubes. A. Superior border or fundus of the womb. B. Cavity of the womb. C. Cavity of the neck of the uterus. D. The canal of the Fallopian tube cut open. E. The fimbriated extremity or pavilion, likewise laid open. F F. The ovaries, one-half of which has been removed so as to bring into view several of the Graafian vesicles. G. The cavity of the vagina. H H. The ligaments of the ovaries. G G. The round ligament.

The *cervix* is the inferior portion of the uterus. It is nearly as long as but much smaller in diameter than the body of this organ. The cervix is somewhat conical, tapering from above downwards, and is flattened from before backwards, especially in women who have had children. Its extremity is about half an inch in trans-

verse, and one-third of an inch in conjugate diameter. Its orifice, called the os tincæ, os externum, or os uteri, is bounded by two lips, the front one being apparently the longer on account of the position of the womb. The name os tincæ, though generally used synonymously with os externum and os uteri, is applied by some of the older writers, particularly Cazeaux, to the inferior end of the neck of the uterus, but not to its orifice.

The os uteri varies much in form in different women, but in the adult virgin it is generally either a smooth circular opening, or a transverse slit, difficult to feel and not larger than a goose-quill; whilst in the woman who has borne children it is more jagged and irregular, and much larger, being sometimes large enough to receive the end of the finger.

The cervix itself, under these conditions, assumes corresponding changes. It loses its conical and symmetrical shape, and also becomes shorter. The cervix dilates to a very great extent during parturition to allow the escape of the child. It normally projects into the upper part of the vagina about half or three-quarters of an inch, and in such a way as to leave a cul-de-sac or *fornix vaginæ* in the latter, just behind the cervix itself.

This *cul-de-sac* is of gynæcological importance in the diagnosis and treatment of displacements of the uterus, but must not be confounded with Douglas's cul-de-sac, or pouch, which lies not inside, but just outside of the posterior-superior part of the vagina, and behind the inferior portion of the uterus, and is, as I have already stated, a fold of peritoneum formed by a reflection of this membrane from the posterior and inferior part of the uterus to the anterior portion of the rectum.

Position of the Uterus.—The uterus of the adult female in its normal unimpregnated condition, may be considered as lying between two planes, the upper one of which extends from the lower border of the symphysis pubis to the promontory of the sacrum, and the lower one from the same point in front, to the lower margin of the fourth sacral vertebra. In childhood it lies much higher in the pelvis than it does in the grown-up female; and, of course, its position varies greatly during the various stages of pregnancy.

Its position varies also in proportion to the relative distension of the various surrounding parts, especially of the rectum behind, and the bladder in front. In ascertaining its normal position and

axis, the rectum and bladder are presumed to be in a moderate degree of distension. The *axis* of the virgin uterus under these conditions is generally considered as corresponding with that of the *superior strait* or *pelvic brim.*

Under certain circumstances, especially when the vagina is very short, the uterine axis may correspond with that of the vagina.

All authorities admit that the neck of the uterus sometimes forms an angle with the womb, by bending forwards in a direction corresponding somewhat to the axis of the vagina. Many of the best authorities contend that this bent axis, so to speak, is the normal and true axis, and not the exceptional one.

All authors, however, agree that, as a rule, the axis of the body of the uterus forms nearly a right angle to that of the vagina. This fact should always be borne in mind in making digital examinations. Both the anterior and posterior *surfaces* of the uterus are convex; the latter more so than the former. The *fundus* is slightly rounded in the vagina, and decidedly so in the woman who has had children.

Dimensions of the Uterus.—The healthy uterus in the virgin adult is, on an average, two inches and three-quarters from its orifice to its fundus; about half of this being taken up by the neck. Its greatest breadth, between the insertion of the Fallopian tubes, is two inches and a half. The greatest thickness, opposite the centre of the body, is about an inch. The average thickness of its wall is half an inch. Its average weight is nine or ten drachms.

The uterus is proportionately very small in the infant and girl; and does not become fully developed until the age of puberty. It is somewhat larger during the period the woman is bearing children than before or afterwards; and, independent of pregnancy, becomes larger during the menstrual period, and then might be mistaken for pregnancy. Of course, during pregnancy the dimensions and weight of the uterus increase enormously; its weight at the full term being two or three pounds.

The *internal surface*, or *cavity* of the *body of the uterus* (Fig. 14), is triangular in shape, with the base of the triangle defined by a line drawn from one to the other opening of the Fallopian tubes, and the apex of the same by the internal os uteri. The *cavity* of the *cervix* is barrel or spindle-shaped, having a constriction between it and the cavity of the body above it, called the internal os uteri,

and another at its inferior extremity, termed the external os uteri, which has already been fully described.

Structure of the Uterus.—The uterus is composite in structure, consisting of three distinct layers; an external, or serous, coat, a lining, or mucous coat, and an intermediate fibro-muscular structure, or parenchyma. *Its serous coat is the peritoneum*, which invests nearly all of the abdominal viscera, and covers nearly the whole of the uterus.

This membrane, after passing backwards over the fundus of the bladder, is reflected on to the anterior surface of the womb, at, or a little below, the base or superior part of the neck; and, passing over the anterior surface, fundus, and posterior part of the womb to the top of the vagina, is reflected upon the anterior surface of the rectum in a peculiar manner, forming between the latter and the inferior part of the womb, Douglas's pouch, already described as being of great gynæcological importance. The womb thus lies antero-posteriorly between a closely-investing fold of the peritoneum, which is also adherent to the upper part of its sides, but not lower down than a little below the Fallopian tubes. It then passes, in two separate laminæ, from each side of the uterus to corresponding sides of the pelvis, thus forming the *broad ligaments of the uterus*, which are divided by some authors into the anterior and posterior broad ligaments, containing between their laminæ the round ligaments, the Fallopian tubes, and ovaries; and allowing a passage for the uterine nerves and bloodvessels. These ligaments constitute the main support of the uterus, as regards its tendency to lateral or downward displacements; at the same time permitting a very free movement either forwards or backwards, in proportion to the relative distensions of either the rectum or bladder.

The latter organ is in close union with the lower portion of the uterus, so that, in displacements of the womb, the bladder is also necessarily displaced; and, during pregnancy, the urethra is changed in direction, and elongated in proportion to the development of the uterus; and it is also at this point that direct communication, as a vesico-cervical fistula, may result from injury or ulceration, or both combined.

Internal Coat.—Although the internal or mucous coat differs in some respects from mucous membranes found in other organs, and has hence given rise to much controversy as to its true char-

acter, it seems now to be generally conceded that it is in reality a mucous membrane. It constitutes from one-seventh to one-fourth of the thickness of the uterine walls at the thickest part, the centre of the body, but in the convex it is much thinner. It has but little submucous cellular tissue, and is firmly adherent to the intermediate or muscular coat of the womb. Its color in the cavity of the latter is of a reddish tint, but paler in the neck. Its smooth surface is dotted over with the minute openings of its numerous utricular glands, which run in undulating parallels perpendicularly through its entire thickness, from culs-de-sac beneath the membrane. They are said to become greatly enlarged during menstruation and pregnancy. The mucous membrane of the uterus, excepting the lower part of the cervix, is lined with a ciliated and columnar epithelium, which becomes transformed during pregnancy by the loss of the vibratile cilia, and the transformation of the columnar into the pavement variety. The lower half of the cervix is lined, like the vagina, with tessellated or pavement epithelium. We shall find, farther on, that the *decidua* or maternal covering of the ovum is not, as taught by the celebrated Hunter, a new formation, but the transformed mucous membrane itself.

The mucous membrane of the neck of the womb is arranged in arborescent folds, thus increasing to a great extent its actual surface, facilitating its dilation, and augmenting its secretion, which is a clear, tenacious, alkaline fluid, poured forth from not less than ten thousand glands, called glandulæ Nabothi. This fluid is the chief lubricating material during parturition. Under morbid influences it sometimes assumes an acid reaction or becomes mucopurulent, or even purulent, and may become very irritating to the parts with which it comes in contact

Intermediate or Fibro-muscular Tissue.—The middle structure of the uterus, which is situated, as its name implies, between the external or serous and the internal or mucous coat, constitutes the greater part of the uterine walls, and is of a fibro-muscular character, as is at present generally admitted by the best anatomists, although this point was formerly warmly contested. Its muscularity is proven by physiological experiments, chemical analysis, anatomy, and, above all, by the phenomena of childbirth.

It is very dense in structure, thin at the opening of the Fallopian tubes, but thick at the fundus and middle of the body of the

womb. Its muscular fibres are of the plain variety, arranged in bundles, and intermingled with fibro-areolar tissue. In the non-pregnant condition these fibres are arranged in very irregular bands and layers, and yet may be considered, in a general way, to have their external layer arranged somewhat longitudinally, and their internal layer circularly. This arrangement is more demonstrable during pregnancy than at other times.

CHAPTER III.

THE FEMALE ORGANS OF GENERATION (CONTINUED).

THE BLOODVESSELS OF THE UTERUS.—The uterus receives its blood from the *ovarian* and *uterine arteries*, one of each on either side. The ovarian arteries, which supply the upper part of the organ, have their origin from the aorta just below the renal arteries; and the uterine, which are distributed to the lower portion of the uterus, arise from the anterior division of the internal iliac arteries. They have thick, well-developed walls, and are remarkable for their tortuosity; these being essential elements of preservation during gestation, especially in the latter months of pregnancy, when these vessels are stretched to the uttermost.

Passing between the laminæ of the broad ligaments, the ovarian and uterine arteries of one side penetrate the muscular coat of the womb and anastomose freely with similar vessels on the opposite side, as well as with each other. They terminate in minute capillaries, arranged in small meshes surrounding the utricular glands, and in a fine network on the surface of the mucous lining of the womb. The capillaries terminate beneath the mucous membrane in the plexuses, communicating with small veins without valves, which, by their union, form large veins. The latter become much increased in size during pregnancy, and then receive the name of uterine sinuses. After coursing through the substance of the womb, where they anastomose freely with each other, these large veins or sinuses pass outwards and unite in the folds of the broad ligaments with each other, and with the vaginal and the ovarian veins, to form a large network of veins, called the *pampiniform plexus.*

The uterine vessels, previous to puberty, are very small, as the womb then requires blood for no other purpose than nutrition; but after that period the wants of this organ are increased in order to fulfil its functions of menstruation; and hence an increase in the size of its arteries and of its veins is demanded. Owing to the peculiar position of the womb, and the fact of its veins having no valves, it is particularly predisposed to hyperæmia.

THE LYMPHATIC VESSELS.—The uterus is amply supplied with lymphatics, which originate between the fine bundles of connective tissue beneath the uterine mucous membrane, in what are termed lymph-spaces. Their origin is closely connected with the ultimate ramifications of the uterine bloodvessels, and with the utricular glands. As they pass from these minute springs, or spaces, they gradually assume, in the external muscular tissue of the uterus, the form of vessels, which increase in size by union with each other, and form, beneath the external or peritoneal coat of the uterus, a large network, which covers the posterior and anterior surfaces of this organ. The lymphatics composing this network finally converge into vessels of still larger dimensions, which communicate with the lumbar glands. The lymphatics of the neck of the womb unite with the pelvic glands. The lymphatic vessels of the uterus, through their power of absorption of septic as well as other materials, perform an active part in the causation of *septicæmia* and other *puerperal diseases*.

THE UTERINE NERVES.—The precise source and distribution of the nerves of the uterus have given rise to much discussion. All authors agree that the sympathetic system furnishes the main supply; and that the renal, ovarian, inferior aortic, and hypogastric plexuses contribute largely to the nervous supply; but, as the latter plexus is connected with the sacral nerves, it is believed by some, and denied by others, that a few filaments from the cerebro-spinal system are distributed to the neck of the womb. Jobert, and a few others, whilst admitting that the portion of the cervix uteri above the insertion of the vagina is well supplied with nerves, deny that the vaginal portion of the cervix has any nervous filaments whatever; but the majority of modern authors are of a contrary opinion. There is another unsettled question in regard to the nerves of the uterus, as to whether they become larger and more numerous during gestation than before. Tiedemann and Dr. Robert Lee take the affirmative, and J. Hunter and Dr. Beck the negative side of the question.

ABNORMAL FORMS OF THE UTERUS AND VAGINA.—Before concluding the anatomy of the uterus, it is practically important that I should allude to what are considered the anomalies of the uterus and vagina.

A double, or partly double uterus is the most common of these deviations from the regular standard. A reference to the devel-

opment of the uterus in the fœtus will throw some light upon this interesting subject. On each side of the spinal column of the female human embryo there may be found a number of tubes, known as the Wolffian bodies, opening into an excretory duct. On the external border of these tubes are two canals, called the canals of Müller, which are the efferent tubes of the embryonic rudimentary generative apparatus. These canals, as well as the excretory ducts, extend to a common cloaca of the urinary and digestive organs. They also gradually form a union with each other from below upwards, and, ultimately, the partition between them becomes absorbed, leaving only a single cavity.

The union of these canals of Müller constitute the uterus. If there be a check in the development of the womb, before the absorption of the partition, the latter, or a portion of it, may permanently remain, thus giving rise to a double vagina and uterus; a double uterus, or a partly double uterus, depending on the extent of the remaining partition. Dr. Matthews Duncan has recorded, in his *Researches in Obstetrics*, several cases of double vagina connected with a single uterus. This curious anomaly has also been observed by other authors.

The abnormal deviations of the uterus and vagina are not incompatible with either menstruation or pregnancy. In the majority of cases, menstruation is but slightly, if at all, affected; and pregnancy has often occurred. Serious trouble sometimes arises during the period of gestation. It may, for instance, be the case that the side or horn of a double uterus is not of sufficient capacity to admit of the full development of the fœtus, and rupture follows as a natural consequence.

Impregnation may occur in either horn of a bifid uterus, separately or alternately, or in both sides at different periods, that is, conception in one horn taking place whilst a fœtus is being developed in the other. In the latter case, where the interval between the periods of impregnation is short, it might give rise to a suspicion of superfecundation; and where a considerable time has elapsed, to the belief of superfœtation. The difference between these three anomalous conditions of pregnancy will be pointed out in the proper place. Where pregnancy takes place in a single uterus connected with a double vagina, the vaginal septum will generally require division.

Ligaments of the Uterus.—In describing the external or peri-

toneal coat of the womb, I had a good deal to say about the broad ligaments, which are two folds of the peritoneum on each side of the uterus, connecting this organ with the pelvis. The uterus has, besides these, three other ligamentous supports; two of which, the sacro-uterine and vesico-uterine ligaments, are also furnished by the peritoneum. The *sacro-uterine* or *utero-sacral* ligaments are two crescentic folds of the peritoneum, extending from the posterior inferior surface of the uterus to the third and fourth sacral vertebræ. They are sometimes called the right and left utero-sacral ligaments, and form the right and left walls of Douglas's cul-de-sac. The anterior wall of the latter is the womb and upper posterior part of the vagina; and its posterior wall the rectum and sacrum, or rather the peritoneal reflections upon these surfaces. The *vesico-uterine ligaments* extend from the anterior inferior part of the body of the womb to the bladder.

Besides these ligaments, there are two others of an essentially muscular structure, called the *round ligaments*, which are connected with the upper edge of the uterus, and thence extend between the folds of the broad ligaments to the inguinal canals, along which they pass, and blend themselves in the cellular tissue of the *mons veneris*.

Mr. Rainey's hypothesis that the special function of these ligaments is to draw the mouth of the womb forward, during coition, into a favorable position for receiving the semen, meets with the concurrence of several late writers, but is not considered very tenable by most authorities, who hold that its main function is to prevent the womb from being displaced backwards by a distended bladder.

THE FALLOPIAN TUBES.—We come next to the consideration of structures of the greatest physiological importance. I have reference to the Fallopian tubes, which are two in number, one on each side of the uterus, from three to four inches in length, and extend from the lateral and superior angles of the uterus, along the upper or free margin of the broad ligaments to the neighborhood of the ovaries. Their course is at first transversely outwards from the uterus, in nearly a straight line, then in a tortuous manner, downwards, backwards, and inwards.

Their canals at the uterine ends are exceedingly small, barely admitting a bristle; but dilate in their outward course and expand into trumpet-shaped extremities, which contract a little at

their distal or ovarian ends. The latter are irregular and fringed, and hence are denominated *fimbriated extremities.*

The fimbriæ surround the orifices of each tube in a circular manner and droop towards the ovary of each side, with which one of the fimbriæ is attached in such a way as to assist the tentacles in seizing the ovary when the ovum is mature and about to escape, and of bringing it into the oviduct, along which it passes to the womb. Besides its function of thus conveying the mature ovum, fecundated or otherwise, as the case may be, to the uterus, the oviduct or Fallopian tube also transmits the semen to the ovary.

There are three coats to the Fallopian tubes—the external or peritoneal, the middle or muscular, and the internal or mucous, which is continuous at the distal or ovarian end with the abdominal peritoneum; thus presenting the only example in the body of the junction of a serous with a mucous membrane, or of a serous cavity that has an external communication.

THE OVARIES.—We shall now call attention to those essential organs of generation in the female known as the ovaries (Fig. 15),

FIG. 15.

Ovary of the Young Female after Puberty. A. Body of the ovary. B. Utero-ovarian ligament. C. Tubo-ovarian ligament. D. Fallopian tube. E. Fimbriated extremity of the tube.

which are two almond-shaped bodies, situated about an inch and a half from the uterus—one on each side—and connected with the upper angles of this organ by duplicatures of the broad ligaments and by special ligaments of muscular fibres called the utero-ovarian ligaments (one to each ovary). They have also connections with the fimbriated extremities of the Fallopian tubes, by one of the fimbriæ on each side, as already described, and are placed a little behind and below these fimbriæ, and usually below the brim of the pelvis. During pregnancy they rise into the abdominal cavity in proportion to the growth of the uterus.

Their loose attachments render them peculiarly liable to displacements, especially downwards into *Douglas's cul-de-sac*, or forwards as hernia into the *labia majora*. They vary much in size in proportion to age, and even in persons of the same age, but have an average weight of ninety grains, and are about an inch and a half in length, half an inch in thickness, and three-quarters of an inch in width. Their dimensions are considerably augmented at each menstrual period, and also during pregnancy, when they occasionally attain to more than double their ordinary size. They shrink and become atrophied after the childbearing period. Their surfaces are whitish and smooth before puberty, but become more or less roughened and scarred after the commencement of menstruation by ruptures of the *Graafian follicles*.

They are the analogues of the male testicles, and hence have received the name of *testes muliebres*. Without these organs fecundation would be impossible, as they contain the ova. This fact is so well understood by farmers that they, when desirous of preventing their sows from breeding, extirpate their ovaries. The same operation may be performed on bitches, cows, mares, and other animals, and even on women themselves.

The spaying of women was not very uncommon even among the ancients. According to Strabo and other writers it was the custom of certain kings of Lydia to have the ovaries of some of their female servants and concubines removed. In modern times this operation has been, until quite recently, limited to pathological conditions of the ovaries themselves, but within a few years it has been performed by several gynæcologists with the object of retarding and lessening the growth of certain intractable fibroid tumors of the womb, and with partial success.

The ovaries may be extirpated either through an abdominal or vaginal incision; the latter being attended with the least fatality.

Of course the removal of both ovaries prevents ovulation and impregnation, yet it does not invariably put a stop to a discharge from the womb resembling the menses—at least for a few months. Neither does it unsex the woman any more than castration after puberty unsexes a man. In the latter the power to inseminate is lost; in the former the susceptibility of being impregnated; but in both the sexual propensities are but little, if any, impaired. Owing to a knowledge of these facts the modern eunuch of Oriental

nations is not merely castrated, but has to suffer a complete ablation of his genital organs.

The ovaries have an outer or peritoneal investment, a fibrous coat, called the *tunica albuginea*, and a *stroma*, which is a dense fibro-nuclear and highly vascular tissue, composing the bulk of the organ.

Anatomists formerly supposed that the peritoneum covered the ovary in the same manner as it does other organs, but this view is now considered erroneous. It does not invest the ovary completely, but leaves on its inner border a free space, the hilum, where nerves and bloodvessels are permitted to enter the organ. It is maintained by Waldeyer that this investment is not a true peritoneum, but a prismatic epithelium, continuous with the peritoneum, but separated from the latter at the base of the ovary by a circular white line.

THE GRAAFIAN VESICLES.—On a microscopical examination of a longitudinal section of the ovary we will find imbedded in its stroma a vast number of little follicles, or vesicles. They differ

FIG. 16.

This figure represents a longitudinal section of the ovary, showing the arrangement and different degree of development of the Graafian vesicles.

greatly in size, and many of the larger ones may be seen by the unassisted eye (Fig. 16). In fact a few of them attain at maturity a diameter of from one-tenth to one-fifth of an inch. After the age of puberty we may usually find scattered about in the stroma of the ovary, especially near the surface, from fifteen to twenty of these follicles visible to the naked eye, varying in size from that of a pin's head to that of a pea. The mature vesicle just prior to rupturing at the period of ovulation may even exceed the latter dimension.

It is asserted by Henle that each ovary in a girl of eighteen years contains about 36,000 of these little bodies. M. Sappey estimates the number at over 300,000. Foulis places their number at

birth at not less than 30,000, and believes that their number is diminished in after-life by pressure from those that become developed, and of course to a slight extent by ovulation.

They are formed, according to the researches of several of the most eminent German writers, in early fœtal life from cylindrical projections of the investing epithelium of the ovary into the substance of this gland. Dr. Foulis differs from this view as to their formation, and asserts his belief that they are formed by the growth of delicate processes of the connective tissue lying around and between the ova. It is asserted by most authorities that the Graafian vesicle has three special coverings (Fig. 17), that is, an external covering, divisible into two coats; and an internal granu-

FIG. 17.

Diagrammatic Section of Graafian Follicle. 1. Ovum. 2. Membrana granulosa. 3. External membrane of Graafian follicle. 4. Its vessels. 5. Ovarian stroma. 6. Cavity of Graafian follicle. 7. External covering of ovary.

lar epithelial layer, besides a vascular layer external to all of them. Several writers doubt the existence of any distinct coats, and deem the usually described vascular layer as merely a network of bloodvessels.

Only a few of the Graafian vesicles ever arrive at full development, and these not until the age of maturity, or puberty, at which time only do they contain ova capable of being fecundated. At every menstrual period one of these ova becomes mature, and the ovisac or Graafian vesicle opens so as to afford an escape to its contents, including the ovum, which is conveyed by the Fallopian tube to the womb, where, if fecundated, it remains for development into the fœtus; if not fecundated, it passes off with the menstrual fluid, in either case leaving behind a peculiar formation called *corpus luteum*.

We shall enter into this subject more fully when we come to the discussion of ovulation and menstruation, and shall conclude what we have to say about the Graafian vesicle, follicle, or ovisac, by a description of its contents, the most important part of which is the ovum (Fig. 17). The latter at first, and while the Graafian vesicle is imbedded in the ovary, lies in the centre of the follicle, but when the latter matures and rises to the surface of the ovary, the ovum also rises to the free surface of the follicle. The ovum is about $\frac{1}{120}$th or $\frac{1}{180}$th of an inch in diameter. It is surrounded by a layer of columnar cells, differing in many respects from those of the *cumulus* or *discus proligerus*, in which it is imbedded. Its cavity is full of a viscid yellow fluid, the yelk, containing many granules. In the centre of the yelk in young, and in some portion of its periphery in mature ova, we find the *germinal vesicle* or *germ cell*, about $\frac{1}{120}$th of an inch in diameter, which in its turn contains a nucleus or collection of fine granules, called the *macula germinativa* or *germinal spot*. To summarize, we find, that *each ovary* contains many thousands of *Graafian vesicles* or *ovisacs*, that *each of the latter* contains, besides the granular membrane and the liquor folliculi, the *ovum*, called by some the germ cell; that the *ovum* contains the *yelk*, surrounded by the *zona pellucida*, or vitellary membrane; that the *yelk* contains the *germinal vesicle*; that the *latter* contains the *macula germinativa* or *germinal spot*.

THE MAMMARY GLANDS.—We shall next consider those highly-important organs known as the *mammæ*, breasts, or mammary glands

FIG. 18.

1. Galactophorous ducts. 2. Lobuli of the Mammary Gland.

(Fig. 18). These organs are found only in the highest type of *animals*, which are thence known as mammals or mammalia.

SIZE.—As an almost universal rule, they exist in a rudimentary state in the male. This is also the case, but not to the same ex-

tent, in the female up to the period of puberty, when the full development usually takes place. They become greatly enlarged during pregnancy, owing chiefly to hypertrophy of their true glandular tissue. Although the breasts of girls at puberty are developed, yet they are small in comparison to what they become in the full-grown woman, and especially in pregnancy. They are also hard, more plump and more hemispherical, and do not hang loosely from the thorax, as is frequently the case in women after they have given birth to children. In aged females, the mammæ are wrinkled, knotty, and flabby, and in extreme old age they disappear almost entirely.

The breasts occasionally become so elongated by being allowed to hang down, or from being drawn out, that the mothers can nurse their offspring beneath their arms or over their shoulders. This is a common practice among the Hottentots and some of our American Indians. The breasts in some women become enormously developed. There is an instance related by Jean Borel of a girl, each of whose breasts weighed thirty pounds. This is not at all incredible, as any one may see a breast even larger than these at the museum of the Vienna University, that is said to weigh thirty-two pounds.

Number.—The normal number of breasts is two, but there has been one reported case of five. The number of these organs where polymazia exists is usually three or four, most commonly the former number.

Position.—The mammary glands, when normal in number, instead of being placed upon the abdomen, as in most animals, are, in the human female, situated one each side of the sternum, over the pectoralis major muscles, between the third and fifth ribs; and, when fully developed, extend from the third to the seventh rib, and from the axilla to the side of the sternum. It is stated by Hyrtl that when a woman has three breasts, the third one is usually located on the sternum. According to Dr. Sneddon, the third breast is sometimes formed on the left side near the axilla; and according to Monsieur Jussieu, in the inguinal region. Robert relates an instance of its being located upon the outer part of the left thigh, a few inches below the trochanter. Saunois relates the case of a woman with four breasts, two of which were on her back. Dr. Fancourt Barnes states that he saw a woman in St. Thomas's Hospital who had four breasts, two in the usual places

on her chest, and the other two on her abdomen, on each side of the navel. The breasts are sometimes absent. Dr. Lousier mentions an example of a woman without a breast, who transmitted the vice to her daughter. It may be remarked in this connection that both amazia and polymazia are hereditary.

A polymazia woman, in the event of childbirth, may have milk in all her breasts. It is related that the female with five mammæ, alluded to above, had four of them prominent and full of milk. She was a vivandière, and was made a prisoner by the French army in 1808.

Mr. P. Shannon reports, in the Dublin *Quar. Jour.*, vol. v, page 266-7, an instance of a woman, Annie Merriman, aged 34 years, who had four breasts, which, when seen after her sixth confinement, were full of milk. Mr. Robert relates the case of a woman who nursed her child for three years from a nipple on her thigh, and the child, after becoming able to walk, would stand up beneath its mother's clothes and nurse.

One of Henry the Eighth's wives, Anne Boleyn, is reported to have had six toes and three breasts. Men also may have largely developed breasts, secreting milk enough for an infant. Prof. Hall, of the University of Maryland, once exhibited to his class a case of this kind, and we may find similar examples in medical literature.

STRUCTURE.—The mammary gland is of a pinkish-white color, of a firm consistence, and its true glandular structure is racemose in character, being composed of from fifteen to twenty lobes, each of which is subdivided into lobules, which consist of an aggregation of the terminal acini, the true secretory structure in which the milk is secreted by epithelial cells. The acini are really very small culs-de-sac, which open into minute canals, which unite to form for each lobule a common duct, which, in its turn, forms a union with other similar ducts to make one of the fifteen or twenty ducts that lead from as many lobes (one from each) to the nipple, that surmounts the mammary gland itself. These large canals are named *lactiferous*, or *galactophorous ducts*.

As these canals approach the nipple they become dilated, especially during lactation, into what is known as *lactiferous sinuses* for holding milk until needed; but they again contract in passing through the nipple. They do not unite in the latter, but proceed to the summit and discharge their contents by separate orifices.

These sinuses are small in the human female to what they are in the cow and lower animals.

Leidy and other anatomists assert that there is an anastomosis between the lacteal ducts, but Sappey dissents from this opinion, yet allows that they have lateral branches.

The lactiferous ducts are chiefly composed of connective tissue, surrounded by numerous elastic fibres, and, according to Robin and Sappey, by a layer of muscular fibres, especially near their extremities. They possess a lining of columnar epithelium, extending throughout their entire ramifications, and being continuous with the same membranous lining of the acini.

The intercostal and internal mammary arteries furnish the mammæ with blood; and the thoracic and intercostal branches of the brachial plexus supply them with nerves. Their numerous lymphatics have connection with the glands of the axillæ.

At the summit of the breast is the *nipple*, which the student may consider of so little importance as to be unworthy of special notice; but in the course of his professional career he will be compelled to listen to many complaints about sore nipples, which really cause a vast deal of suffering to women, and, if neglected, frequently lead to inflammation of the mammæ themselves. The nipple varies much in size in different females, and is usually larger in women who have borne children than in virgins.

At its summit are found the openings of many sebaceous follicles and of lactiferous ducts. Although the nipple, on being irritated, hardens and contracts, it probably does not do so on account of any erectile properties, as some authors assert, but owing to the contraction of its muscular fibres, lying beneath the skin, mixed with elastic and connective tissues.

In deciding the question of pregnancy, the physician is frequently called upon to notice the color and diameter of the *areola* surrounding the nipple. It is then well for him to remember that in virgins this circle is of a pink color, and the diameter about an inch, and that, during pregnancy, it becomes dark from the development of pigment cells, and of a much greater breadth. It retains, in some degree, this dark color after childbearing.

On the surface of the areola are from fourteen to twenty-two small prominences, called tubercles, which are supposed by some authors to have a connection with the lactiferous ducts and to secrete milk. They are probably only sebaceous glands which

secrete a fatty matter to protect the nipple during lactation. They increase in size and prominence during pregnancy, and thus furnish evidence of the latter condition.

MILK.—The proper secretion of the *mammary glands* is *milk*, which, however, is rarely formed, except during pregnancy, and especially after childbirth. During the inactive state their secretion is only a viscid mucus. When, from the application of the child to the breast, the milk is rapidly secreted, the woman experiences a peculiar sensation as though milk were rushing into the mammæ. This is called by nurses the "draught."

CHAPTER IV.

SPECIAL FUNCTIONS OF THE OVARIES AND UTERUS; OR OVULATION AND MENSTRUATION.

HAVING described the principal anatomical features of the uterus and its appendages, we shall next endeavor to study these organs from a physiological point of view.

Their special functions are *ovulation and menstruation.* We mean by ovulation to express those changes and attendant phenomena that accompany the maturation and discharge of the ova. It is generally associated with the "rut" in many of the lower *mammalia*, and with *menstruation* in woman. I say generally, because there are many cases where ovulation occurs without the manifestation of its external phenomenon of menstruation. This is doubtless the case in those instances where impregnation occurs in women who have never menstruated, or have temporarily ceased to menstruate on account of lactation. These exceptions to the theory that ovulation and menstruation always bear the relation of cause and effect are considered by some as sufficient to overthrow this theory itself, and the opposition seems to be gaining strength of late. Yet as the great majority of physicians have full faith in the doctrine of ovular menstruation, I shall endeavor to elucidate the subject to the best of my ability.

Unlike the lungs and the heart, which not only begin their offices at the hour of birth, but continue their round of duties unceasingly by day and by night until life itself is no more, the *ovaries* and the *womb* lay in a dormant condition until the period of puberty, when they are aroused into activity, which continues intermittingly for about thirty years, and then ceases entirely.

The time of their first awakening into functional life may be compared to the spring of the year, when all nature is aroused from its slumber; whilst their final period of functional rest is not unlike the cold and icy winter. Or in plainer language, puberty develops in a female a new life and new hopes. She then passes hood to womanhood, and is no longer the romping loud-

voiced, half boy and half girl, but the gentle, tender, subdued-toned, modest and reserved young woman.

There are also at this period remarkable modifications in her physical appearance. Her figure becomes more fully developed; her breasts enlarge; her hips acquire a greater breadth, corresponding in some degree to an increased volume of the internal generative organs; the pubes become covered with hair, and there are sensations connected with the organs of generation unfamiliar and inexplicable to the newly made woman.

Coincident and intimately connected with these changes is the *maturation* of one or more of the many thousands of those little bodies contained in the ovaries, known as *Graafian follicles* or

FIG. 19.

A A. Ovary enlarged under menstrual nisus. B. Ripe follicle projecting on its surface. a a a. Traces of previously ruptured follicles.

Graafian vesicles, which have up to this period laid in a state of dormancy. A limited number of them, rarely exceeding twenty, begin to increase in size, and approach the periphery of the ovary, when a rapid development occurs in one or more of them preparatory to rupture. The size of a follicle just previous to rupture is about that of a gooseberry or very large pea, and sometimes even of a small cherry. It then forms a projection on the surface of the ovary. (B. Fig. 19.) Its growth is chiefly owing to an increase in its fluid contents. The capillaries surrounding it become at the same time congested, and some of them lying beneath its inner coat become ruptured, discharging their blood into the cavity of the follicle. This extravasation of blood occurs before the laceration of the latter and adds to its tension.

According to Pouchet the blood collects behind the ovum and pushes it up to the surface of the follicle (Fig. 20). The pressure caused by the augmentation of the follicle gradually thins the external ovarian structure against which it impinges from within; so that, when the former ruptures from overdistension the tissue

FIG. 20.

Diagram showing the Layers of the Graafian Vesicle, and the contained Ovum.

of the latter also gives way; thus allowing the ovum with many of the cells of its surrounding membrana granulosa (Fig. 21) to escape into the grasp of the fimbriated extremity of the Fallopian tube, which has meanwhile been applied to this part of the ovary, when it is conducted by the vibratile cilia of the epithelial lining of the fimbriæ into the canal of the tube, along which it passes to

FIG. 21.

Diagrammatic Representation of the Ovum as it escapes from the Graafian Vesicle.

the womb. It may be well to remind the student that the ovary is grasped by the fimbriated extremity of the Fallopian tube only during the period of full maturation of the ovum or dehiscence of the Graafian follicle and ovary for the escape of the same. At all other times it is simply attached to the ovary by one of its many fimbriæ. The propulsion of the ovum along the canal of the Fallopian tube is owing partly to the muscular construction of the walls of the tube, and partly to ciliary action. The rupture of the

follicle may occur spontaneously, or under sexual excitement. It is not positively known whether the rupture takes place before, during, or after the occurrence of the menses, but these events bear a close relation to each other. The general belief is that it occurs towards the close of menstruation. At the evolution of the ovum there are important changes, particularly congestion, not only in the ovary itself, but in the womb, and in fact throughout the whole internal genital organs.

Corpus Luteum.—In certain medico-legal cases, growing out of the death of a woman from abortion or otherwise, the question of pregnancy often arises. In its decision the size and appearance of the *corpus luteum* are frequently brought under discussion; hence, if for no other reason, it is of importance for the physician to understand what the corpus luteum really is, and under what circumstances it tends to prove pregnancy. After the escape of the ovum, the empty Graafian follicle undergoes peculiar changes. Although diminished in size, it is yet, owing to the effusion of blood into its cavity, moderately large. It, however, if conception has not taken place, soon begins to shrink, and, in proportion to its shrinkage and the hypertrophy of its internal granular layer, the latter is thrown into folds and convolutions, which, in the human subject, are usually of a bright yellow color. This tint was formerly supposed to be owing to the absorption, by the granular layer, of the coloring-matter of the blood-clot contained in the *ovisac* or follicle, but is at the present day believed to be due to the inherent color of the cells of the granular or lining membrane itself, when viewed, not singly, but in the aggregate. The folds of the lining membrane, owing to the proliferation of its cells, continue to enlarge and gradually unite together, until, finally, they completely fill the cavity of the *ovisac*. Then, if there has been no impregnation, the *corpus luteum* shrinks rapidly, and becomes very small by the time of another menstrual period, and soon thereafter almost disappears, and, in many cases, becomes entirely obliterated (Fig. 22). If, on the other hand, the ovum has been impregnated, the *corpus luteum*, instead of gradually diminishing and disappearing in a few weeks, increases in size until about the fourth month of pregnancy, when it forms on the surface of the ovary a slight but firm elevation half an inch in width and an inch in length (Fig. 23). After this period it commences

to atrophy, and disappears completely in about one or two months after delivery.

The corpus luteum is no longer considered an unfailing sign of pregnancy, as asserted by Haller, or, conversely, as of no medico-legal value whatever, as held by many soon after Haller's error was discovered, but is known to be of much importance as a sign between the second and ninth month of gestation. If, during this period, it be found to possess considerable hardness, vascularity,

FIG. 22. FIG. 23.

FIG. 22.—Section of Ovary, showing Corpus Luteum three weeks after Menstruation. (After Dalton.)

FIG. 23.—Corpus Luteum, at the fourth month of Pregnancy. (After Dalton.)

and development, and, finally, to have a white lining membrane, and a large central stellate cicatrix, we can, with much confidence, consider it as a sign of pregnancy.

MENSTRUATION.—By the term menstruation we are to understand a periodical discharge of a moderate quantity of blood from the womb every lunar month, except, as a rule, during pregnancy and lactation, and continuing generally from about the age of fifteen to that of about forty-five or forty-six, but varying in regard to quantity, periodicity, duration, first manifestation, and final cessation, and, in other respects, according to climate, habits, race, temperament, and constitution. This function is possessed by women in all conditions of life, and of every race, and, to a modified extent, in females of some of the lower animals, as the monkeys. I have already alluded to its close relationship to ovulation, and have stated that for a period of forty years the majority of medical men have indorsed the theory that it is the external manifestation of the periodical maturation of an ovum.

A Sign of Puberty.—Menstruation is a sign of puberty; a silent declaration of nature that the female is henceforth, until its final cessation, capable of sustaining her peculiar responsibility in life, in the reproduction of her species. As a rule, all women who menstruate are susceptible of pregnancy, and all who do not menstruate are incapable of bearing children. But there are many exceptions to the first, and some to the last part of this general law. There are, also, many exceptions to the rule that a nursing woman does not menstruate, and a few to the one that a pregnant woman never does.

Menstruation is coincident with all of those other signs of puberty described under the head of ovulation, and is, so to speak, the crowning act of them all. Parents are justly very much exercised about their daughters at the time when this function should first manifest itself, and a delay of a few years in its appearance, even when unattended by morbid symptoms, often causes them very great anxiety. Hence it behooves the physician to become thoroughly acquainted with all its normal and abnormal changes, so as to be able to calm the solicitude of patients and their friends, when unnecessarily excited, and to correct any pathological deviations from the healthy standard whenever they occur.

The menses do not, as a rule, commence for the first time regularly at once. There often are, for two or three months, premonitory symptoms of pains in the breasts and head, a feeling of heat and weight in the loins and back, accompanied by a sense of general weakness and discomfort, and even slight fever. After several weeks or months, a moderate discharge of bloody mucus or blood may show itself, and not again recur for several weeks. At the first establishment of the function such irregularities may usually be considered as coming within the standard of health, and so may slight forms of disorder; but should chorea, hysteria, delirium, or fever of a marked type manifest itself, we should consider the case as abnormal and demanding treatment.

Period of Establishment.—The first appearance of the menses in temperate climates is about the fifteenth year. There are, however, many exceptions to this rule, it being not very unusual for this discharge to make its appearance as early as the tenth year, or on the other hand not to be established until the nineteenth year. There are a few cases on record of its appearance in infancy, and of its retardation until the middle age of life.

ITS SYNONYMES.—Before proceeding further, I shall mention a few of the names given by women to this periodical discharge. Such for instance as the "courses," "monthly illness," "unwell," "periods," "catamenia," "reds," "flowers," etc.

ARE "RUT" AND MENSTRUATION ANALOGOUS?—This question has been the cause of much controversy, and is still unsettled. There is in the mammalia generally a periodical excitement of the female generative apparatus, which is supposed to be due to the maturation and discharge of one or more ova, which, as a rule, in mammalia below the scale of man are susceptible of impregnation at that time only. At that time the female is said to be "in heat," or "in season," and manifests an instinctive desire for copulation. During the period of rest that follows there is no such desire and but slight liability of impregnation were connection to take place. During "the heat" the glands in the region of the pudendum give forth a secretion which attracts by its odor the opposite sex. This secretion is, however, very rarely tinged with blood, except in those animals nearest to man in the scale of animal organization. It is then, true, that we find many points of resemblance between the "rut" or "the heat" in the lower animals—especially in the higher type of mammalia—and in man, but still there are important differences, the chief of which is the absence in the former of a sanguineous discharge. Besides it cannot be said that the desire for *coition* or the *capability* of impregnation is restricted in women to the period of menstrual discharge, whereas these conditions are in the lower animals limited to the time of "the rut" or "the heat." The strongest desire for connection in woman is apt to be just after, and not during the menstrual period, but the desire may manifest itself at any time either during or after menstruation, or during gestation, lactation, before the first, and after the last appearance of the menses. The most susceptible time for impregnation is about a week after menstruation, yet it may occur at any time during the interval of the menstrual periods, or during the discharge, although some authors assert, Playfair among others, that it can only take place in the interval, and Dr. Avrard asserts that it cannot occur in the latter half of the menstrual interval.

OVULATION AND MENSTRUATION.—It is said by the opponents of the ovular theory of menstruation, that if menstruation depends on the rupture of a Graafian follicle, and the emission of an

ovum, that impregnation ought not to occur except during or immediately after a menstrual period.

In reply to this objection Coste says that it is the *maturation* and not the *rupture* of the follicle that produces the discharge, and that the follicle may not be ruptured for some time after its maturity and consequent menstruation, and that the subsequent escape of the ovum may be brought about by sexual excitement or some accidental cause.

It is the custom of some of the rulers in Central Asia to have the ovaries of their concubines, female servants, and female guards of the harems removed. It is asserted that although the operation does not entirely unsex the women, so far as sexual propensities are concerned, yet menstruation and pregnancy are prevented.

As an almost universal rule, whenever double ovariotomy is performed, either upon animals below or in the scale of the human race, menstruation and conception cease. The supporters of the ovular theory of menstruation lay great stress upon these facts, while the opposition insist that because it occasionally happens that a woman who has lost both ovaries may menstruate for a few periods, or even longer, that ovulation and menstruation cannot bear the relation of cause and effect, nor have any close relation whatever. In reply to this objection, it is stated that the very few cases of true menstruation after the removal of both ovaries that have occurred may be accounted for in part by the menstrual habit having become so strong that the discharge might, for that reason, be kept up a little while, even after the cause had ceased to exist, and partly upon the supposition that the ovarian tissues in some, if not all of the cases, were not entirely extirpated.

Among other evidence of the ovular theory of menstruation may be mentioned the fact that when the ovaries are congenitally absent, or when their function has not been established, as in the immature girl, or has ceased, as in the woman after the menopause, or is in abeyance, as in nursing women, impregnation hardly ever occurs. The few exceptions may be explained consistently with the ovular theory.

THE NATURE OR QUALITY OF THE MENSTRUAL DISCHARGE.—During the height of the menstrual period the discharge is pure blood, or blood mixed with a small quantity of mucus, though at the beginning and the decline it may consist mostly of mucus. There

is a difference between the discharge as found in the womb, and in the vagina. The first being susceptible of coagulation, and the latter, except when excessive, not possessing this quality. Hence it was formerly supposed by many observers, especially those who believe its source to be in the vaginal canal, that it was not really and truly blood. The non-coagulability of that taken from the vagina was attributed by Retzius to the presence of free phosphoric and lactic acids.

But Mandl has doubtless given the true solution of the difficulty by showing that it is owing to an admixture of mucus which is always present in the vagina and neck of the womb, or of a small quantity of pus, as either of these fluids will prevent coagulation unless the quantity of blood is excessive, or too large in proportion to the mucus or pus. In order to secure for examination a sample of the discharge as first found in the uterus it is necessary to use a speculum or syringe.

The menstrual fluid exhibits under the microscope mucus and blood-corpuscles, and many scales of the disintegrated epithelial lining of the mucous membrane of the womb.

The color of the discharge is *dark red*, during the height of the period, but is generally of a paler tint at its invasion and decline, owing to the preponderance of mucus.

The ancients believed that the menstrual fluid contained poisons so concentrated that their very exhalation would render wine and milk sour, and blight the freshest flowers of the garden. Its peculiar, faint, and heavy odor, attributed to the decomposition of the mucus mixed with blood, may have given rise to these fanciful and exploded notions.

The Source of the Menstrual Discharge.—There was formerly much controversy about the source of the menstrual fluid, but it is at present universally conceded to be in the lining or mucous membrane of the womb, both from the free surface of the latter and from the utricular glands, and perhaps in that of the Fallopian tubes. This fact has been demonstrated by the examination of the uteri of women dying during menstruation, by the accumulation of blood within the uterine cavity in cases of cervical atresia, by the oozing of blood from the os uteri as seen through the speculum, and more directly still by the actual escape of the blood from the mucous membrane of an inverted womb.

Menstruation is, according to the generally received theory, a

phenomenon dependent upon the maturation of one or more Graafian vesicles During the menstrual flux the ovaries (or, at least one of them), Fallopian tubes, and uterus are considerably enlarged from congestion. The latter is congested in all its structure, but particularly in its mucous lining, which is larger and thicker than it is between the menstrual periods, and thrown into folds, completely filling the cavity of the womb itself. The vascular congestion of the womb is particularly marked in the capillaries lying on the surface of the mucous membrane, just beneath the epithelium, and especially in the network surrounding the orifices of the glands of the uterus. These glands also become much increased in size. On a microscopical examination at this time, of the mucous lining of the womb, small drops of blood may actually be seen lying in the orifices of the utricular glands, from which they may, by gentle compression of the walls, be expelled. This, however, does not decide the question as to how the blood gets out of the capillaries. According to Coste, it simply transudes through their coats without any laceration of their structure. Cohnheim, by recent observations, has demonstrated the possibility of such an occurrence. The uterine capillaries, in the opinion of Farre, terminate in open mouths, allowing the escape of blood during the menstrual period, but closing from the muscular contraction of the uterine walls between the menstrual periods, so as to prevent its escape While Pouchet would have us believe that the hemorrhage is due to the rupture of the small vessels by an entire detachment and disintegration at each menstrual period of the mucous membrane lining the womb—a new lining being renewed in the interval of the periods. We know that there is an exfoliation of the mucous membrane in certain pathological conditions of the uterus—as in membranous dysmenorrhœa—but there is no undoubted evidence that it occurs under ordinary circumstances, or as a physiological process in menstruation, as Pouchet asserts.

Perhaps the most plausible theory is that of Kölliker. He believes, with Coste, that the mucous lining of the womb becomes thickened during the menstrual flow, but that there is besides an exfoliation of the epithelium covering this membrane, and consequent rupture of many of its superficial capillaries. Whether the blood makes its exit from the circulation by rupture of its minute capillaries, or from open ends of the latter, or by transudation or mechanical filtering through the mucous membrane, or whether

it is a secretion of the latter, is as yet not fully determined, but it is certain that the blood is in some way furnished by the mucous membrane lining the cavity of the womb, by the utricular glands, and probably by the lining membrane of the Fallopian tubes.

Periodicity and Duration of each Menstrual Period.—The general rule is that every healthy woman, who is not pregnant or nursing, from about the age of fifteen to forty-five or forty-six, has a recurrence of her monthlies or menses every twenty-eight days. There are numerous variations and exceptions to this rule. Some women will menstruate much earlier, and others much later than the limit assigned, and yet enjoy good health. There are a few instances of women in health menstruating only twice a year. But any serious departure from this limitation will generally indicate a pathological and not a physiological condition of the system. A few women are almost as "regular" as clock-work, while others will usually vary a few hours or a few days in the return of their periods. It is very common at the commencement and decline of the menstrual epoch for the periods to be irregular in the time of recurrence as well as in the quality and quantity of the discharge.

The average duration of a period in temperate climates is four or five days. This average is a little less in cold, and a trifle more in warm climates. But climate does not appear to have the same effect upon the duration of each "period" as it does upon its first appearance, as we shall perceive before the close of the chapter.

The student of medicine will naturally desire to know why menstruation should be periodical. This is one of the questions that have puzzled wiser heads than ours from the earliest dawn of the medical science until the present age, and will continue to perplex our descendants, in all probability, for ages to come. It is true that we can answer this question in a certain way by saying that menstruation is periodical because dependent on the maturation of a Graafian follicle, which matures periodically. If the theory of ovular menstruation be true, this answer may be considered as superficially correct. But when we go deeper, and ask the reason of the periodicity of the ripening of the Graafian follicle, we find ourselves launched into an ocean of theories and hypotheses.

Quantity of the Discharge.—Hippocrates asserts that the quantity of blood lost at each menstrual period is f℥xviij, but this

estimate is entirely too high; the average being about three or four ounces. The quantity is lessened by a cold climate and increased by a hot one. Rich and stimulating drinks and food, and luxurious habits generally, of both body and mind, will assist in the augmentation of the quantity lost at each period.

The flow usually begins moderately, and increases for about two days, and then as gradually declines. Yet there is much variation in this respect in different women, and even in the same person. It not unfrequently returns, especially under excitement of the sexual organs, in a day or so after it has appeared to terminate.

Influence of Climate and Race.—Prior to the researches of Mr. Roberton, of Manchester, published in the Edinburgh Medical and Surgical Journal of 1832, the influence of climate on the time of a first appearance of menstruation was believed to be greater than that gentleman proved it to be; and he has been sustained in his conclusion by the subsequent observations of others. Instead of women in the Arctic regions not menstruating until they were of mature age, and of girls in the tropics doing so habitually at the age of ten or twelve, it is now known that, as a rule, there is not over three and a half years difference in the extremes. The average age for the first menstruation in warm climates is about thirteen; in temperate climates about fifteen, and in cold climates about sixteen years.

Although the mere influence of temperature is the chief factor in these differences, the effect of race has something to do with it; as it has been shown that females changing their residences from one extreme climate to the opposite do not menstruate for the first time exactly at the ages most common for the nations, but more in accordance with their own race in their own climate.

Temperament and Constitution.—These have a modifying influence on the first appearance of the menses. Females of a robust constitution and a nervo-sanguineous temperament, other things being equal, will have their first menses earlier than those of an opposite condition of the system.

Education and Mode of Life.—These also have a decided influence in promoting or retarding menstruation. Girls of our large cities who have their nervous and sexual systems stimulated into action by luxurious living, and by the follies and excitement of fashionable life, especially those abominations, the round dances,

are apt to have sickly and premature activity of the function of menstruation.

On the other hand a life in the pure air of the country, strengthened by regular habits of exercise and sleep; where nature's laws are not disregarded by turning night into day, and day into night; where the table is not constantly filled with articles to tempt the appetite beyond endurance of the digestive organs; where the stomach is not called upon to digest all sorts of candies, pastries, jellies, ice-creams, and perhaps wines, at 12 o'clock at night; in short, where the habits are more in accordance with the dictates of nature and of nature's God, the mind and body are invigorated, and the reproductive functions are not forced into premature activity, and hence menstruation begins later than when nursed in the hot-bed of a crowded city.

Precocious and Tardy Menstruation.—There are a few cases on record of menstruation in early infancy. One of these was reported by the Transylvania Journal of Medicine in October, 1834, by Dr. D. Rowlett, of Kentucky. He states that Sally Dewees menstruated at the age of one year, and gave birth to a full-grown healthy child at the age of ten years and thirteen days. Briere de Boismont records a case of menstruation at the third month, and D'Outrepont one at nine months; and Carus cites a case of a child having her menses at two years of age, becoming pregnant at eight, and living to be an old woman.

On the other hand there are women in the enjoyment of good health who have never menstruated, and who have passed that period of life when they can be called very young, even by admiring friends—the age, for instance, of twenty-three. There are some cases mentioned in the books where menstruation did not make its appearance till between the ages of thirty and forty.

What is the Object of the Menses?—We may say that menstruation is necessary to relieve the overcongested internal organs of generation during the maturation of the Graafian follicles; and that this is proved by the occasional necessity of that singular phenomenon called *vicarious menstruation*, when from any cause the discharge cannot escape from its natural channel, the mucous membrane lining the cavity of the uterus; but this does not seem to meet the question fully. However, we are not prepared to give any better answer, and shall pass to the next interrogatory, "*What is vicarious menstruation?*" It is the flow of blood from the mu-

cous membrane of some other organ than the womb at the menstrual *nisus*, or from the skin. Its most common sites are the mucous membrane of the lungs, stomach, or nasal cavities, or from the skin of the mammæ, or from hemorrhoids, or the surface of an ulcer.

Of course it does not take place at every *suppression of the menses*, but is as rare as singular. It is not looked upon as being strictly a physiological process, but rather a pathological one, and is generally met with in women of delicate and highly mobile nervous constitutions. Although the recurrence of vicarious hemorrhage is regular, and in correspondence with the menstrual *nisus*, the quantity of blood lost is much less than in the *true* functional discharge itself.

"The Menopause," "Critical Period," or "Turn of Life."—The final cessation of menstruation in a woman occurs as a rule at about the age of forty-six, although there are great variations in different women—it occurring in some as early as thirty, and in others not till the age of sixty ; and instances have been given of its not taking place until the very advanced age of between eighty and ninety. These extreme cases are, however, very doubtful.

The cessation rarely occurs suddenly, but is preceded by a few months, or a few years, of more or less irregularities in the time of its recurrence, in the length of each period, in the quantity and quality of blood lost, and by numerous and variable nervous manifestations—especially hysteria. As the final period approaches the menses will occasionally cease for two, three, or more months, and then recur, perhaps with increased quantity ; or they will be slight for a time or two, then regular for a few periods more, and afterwards overabundant for awhile, and thus continue whimsically and fitfully until the final cessation.

Patients under these circumstances often give themselves, their friends, and physicians much unnecessary anxiety and trouble. At one time they will think they are going to die unless something is given them to bring on their courses, at another time that they are about flooding to death, and must have the hemorrhage checked immediately ; at other times they are troubled with neuralgic pains in different parts and organs of the system. Many of these symptoms are really dangerous and some are attended with little or no danger, yet often simulating very grave complaints. The

physician himself is frequently puzzled in regard to his diagnosis and prognosis of these cases.

For example, should his patient after being regular for many years suddenly cease to menstruate, he has to make a differential diagnosis between a number of diseases, but mainly pregnancy, suppression of the menses, and approaching change of life. And if his patient happens to be a well-preserved newly-married woman of about forty-two and over-anxious for a child, he will find it a difficult task to ascertain all the facts for diagnosis, especially her age, for it must be remembered that a woman of that kind, especially if married to a husband young enough to be her son, is never over thirty years of age. When the hemorrhage is excessive one may be at a loss to determine whether his patient is threatened with an abortion, or has some growth, malignant or otherwise, developing in the womb, or some displacement of the latter, or one of the numerous other conditions of the womb accompanied by hemorrhage. The type of women just alluded to would like, under these circumstances, to have their husbands believe their trouble to be a threatened abortion. And when the hemorrhage is checked they will often insist that they have had a "misgo" or abortion.

But I must not dilate upon this part of my subject, as allusion will be made to it again.

While some authors assert that the earlier menstruation commences, the sooner it finally ceases, and *vice versa*, others of equal eminence deny that there is any such relation between the two periods.

The term "critical period" was applied to the final cessation of the function of menstruation, because it was thought to be attended with unusual dangers to the woman—who was insured, if she passed them safely, of a long lease of good health. According to late statistics it is found that mortality among women is not greater at this than at any other period. It is nevertheless admitted that morbid and malignant growths are more apt to be developed in the womb or other parts of the system about this period than at any other time. On the other hand it is not at all uncommon for women who have been martyrs for years to nervous diseases connected with functional derangements of the uterine system, to regain their health completely after the "change of life."

The final cessation of menstruation is followed by a general atrophy of the womb, ovaries, and Fallopian tubes, and sometimes by obliteration of the latter.

The cervix uteri ceases to project into the vagina, and in the course of a few years the orifice of the womb becomes on a level with the roof.

The woman having fulfilled her destiny in the birth of children, and having passed the summer of life, now lives to guide her offspring into paths of usefulness and honor, that they may prove a blessing to her in the winter of her declining life.

CHAPTER V.

FECUNDATION AND PRIMARY STAGES OF OVARIAN DEVELOPMENT.

HAVING in the last chapter discussed the subjects of ovulation and menstruation, we come next in order to the consideration of one of the most interesting and important problems of human life, the *reproduction* of our species. Look abroad upon the world and listen to the unceasing hum and commotion of the millions of human beings that are performing their parts on the stage of life, and consider for a moment what a change would come over the scene in a few short years, at most, if human generation were to cease. The earth would no longer be a habitation for man, the most noble of all God's works. Still greater would be the change if reproduction were to cease throughout all animated creation. The world would then, in truth, become a void and blank. The subject is too vast for a complete elucidation in a work on obstetrics, and as other matters demand a due share of attention, I shall only glance at a few of the most practical questions bearing on the act of generation as confined to our own race.

It would be a tedious and unprofitable task to describe the many conflicting theories that have been advanced by physiologists upon the subject of generation. Drelincourt reckoned them at two hundred and sixty-two, to which he added another, no better than the others.

From the hidden nature of the process, and its grand importance, it is not to be wondered at that physiologists in all ages have taken a deep interest in its solution. But the early observers had not the opportunities and means of investigation possessed by those of more recent times, especially the aid of that most wonderful instrument, the *microscope*, which was not used in scientific investigations until the seventeenth century. Nor had they the aid furnished by the modern developments in chemistry, pathology, and physiology. With all our modern facilities we, even now, cannot understand this intricate subject as clearly as we would desire, yet I shall try to explain such theories and facts

as are accepted by the most noted physiologists of the day. The most important of these is that

FECUNDATION IS THE JOINT ACT OF BOTH SEXES.—It consists of a series of processes, culminating in the formation of a living being, capable of an independent existence. It demands, in the first place, a contact of the male element with the female element of generation, the *semen* with the *ovum*, embracing as one of its first steps the process of *copulation*. The contact of the semen with the ovum produces fecundation, or impregnation. When this occurs the woman is said to have conceived. But how is this brought about? I have already described the ovaries as containing many thousands of those curious little vesicles, called *Graafian follicles*. It must be remembered that each of the latter contains an *ovum*, and this a *germinal vesicle*, which, in its turn, contains a *germinal spot*.

About every twenty-eight days in a woman, during the menstrual epoch, a Graafian follicle arrives at maturity, and, bursting, permits an ovum, which, in the meantime, has also undergone certain peculiar changes, to escape. The latter is then seized by the fimbriated extremity of one of the Fallopian tubes, and is carried through the canal of the same to the womb, there to remain, if vitalized, for development into the fœtus; if otherwise, to pass off with the menstrual fluid.

THE SPERMATIC FLUID.—I shall now endeavor to describe how the ovum becomes vitalized.

The reader has already been informed, in a general sense, that it was effected by being brought in contact with the *spermatic fluid* of the male. If, however, this fluid should not contain any of those curious little bodies called *spermatozoa*, this result could not be obtained. Hence, before going further, we must have a proper understanding of the nature of the spermatic fluid itself.

It is an opalescent, viscid fluid, capable of forming an emulsion with water, and possesses a peculiar faint odor, and is secreted by the testicle of an adult male. When this fluid is examined under the microscope having a magnifying power of six hundred diameters, we can observe a certain number of granules and epthelial cells, derived from secretions of the prostate and Cowper's glands, mixed with it, and those *essential constituents* the *sperm cells* and *spermatozoa*. There is a little confusion by authors as to what is meant by the term *sperm cell*, some designating it the

vesicle of evolution, and others the *parent cell*, containing the latter, by this name. If the semen is examined in the epididymis, or testis, under a high magnifying power, there will be seen a number of large *spherical vesicles* or *parent cells*, each containing from two to nine *smaller cells*, called by some *vesicles of evolution*, each of which incloses a spermatozoon (Fig. 24). These *parent cells* and *vesicles of evolution* are, as a rule, only to be detected before the semen is ejaculated, as they generally burst, or become absorbed, prior to that event, and allow the spermatozoa to escape. Occasionally the smaller cells burst before the absorption of the mother cells, when the spermatozoa will be found floating in the

FIG. 24.

a, *b*, Sperm cells, containing nuclei, each nucleus having within a spermatozoon; *c*, nucleus, with nucleoli; *d*, nucleus, with spermatozoon; *e*, a cell, with a bundle of spermatic filaments; *f*, *g*, *h*, spermatozoa.

latter in the form of a bundle. The spermatozoa are invisible to the naked eye, but the student will find, on examination by the microscope, that they bear a close resemblance in shape to tadpoles, and to those ethereal wanderers, the comets, that at long intervals of time show themselves to our astonished gaze. Please remember that I have stated that they resemble the latter only in shape but not in dimensions. Although insignificant in size they are capable of more good or evil, as the case may be, to the human race than all the comets that have ever flashed through universal space.

They are the agents of great happiness or of untold misery in myriads of homes. Of happiness, when guided in their mysterious errands by conjugal love; of misery, when allowed to range the sacred precincts of virginity in a wicked and unlawful manner. The head of a spermatozoon is about $\frac{1}{800}$th of an inch in breadth, and has attached to it a long filiform tail, which tapers to a point exceedingly fine. The entire length of the spermatozoon is from

$\frac{1}{350}$th to $\frac{1}{600}$th of an inch. Spermatozoa possess vitality and the power of motion—the latter being undulating and constant, but variable as to rapidity. Their average motion is about an inch in thirteen minutes. They retain these qualities for two or three days after emission, provided the seminal fluid is kept at its natural temperature. It is asserted that they sometimes retain their vitality for twenty-four hours after the death of a person.

They are only found in the semen after maturity, which is generally reckoned at about fourteen years of age, though it varies somewhat in different individuals, and is influenced by race and climate.

Owing to the fact of their possessing life and motion they have been classed among the animalcula. And although many modern physiologists contest this classification, and liken their motions to ciliated epithelium, yet the animalcular theory is by no means exploded, as a few late authors would have us believe. Contrary to the views held by some of the older physiologists, it is now universally believed that the fertilizing power of the semen is due entirely to the presence of the spermatozoa. If the spermatozoa are absent, as is the case before maturity in certain cases of disease, debility, old age, and in hybrids, impregnation is impossible. Let these minute particles be separated by filtration, as was first shown by Prévost and Dumas, and the spermatic fluid no longer retains the power of impregnation.

The Site of Impregnation.—I have stated that generation is the joint act of both sexes, and have described the nature of the two essential elements for bringing it about. The questions now arise as to how the *spermatozoon*, the male element, finds its way to the female element or *ovum*, and in what particular site they meet to consummate the acts of fecundation. There has been much difference of opinion upon these points, but the preponderance of evidence tends to prove that the spermatazoa are carried upwards to the ovum chiefly by their inherent mobility, aided possibly by the peristaltic action of the uterus and Fallopian tubes, and a capillary attraction when the walls of these organs are in contact, and a suction action of the os uteri during the sexual orgasm.

It is also generally held that the site of contact between the two elements is usually in the upper part of the Fallopian tube, shortly after the rupture of the Graafian follicle, although it may

occur anywhere in the tube and on the surface of the ovary, and possibly even in the latter and in the uterus. The possibility of its occurrence within the ovary of the human female is inferred from the fact that in certain of the lower animals conception has taken place at this site, and also that ovarian pregnancy tends somewhat to this conclusion. Coste believes that impregnation can only take place just within the fimbriated end of the Fallopian tube, or on the surface of the ovary itself. He says that the impregnated ovum, very soon after its expulsion from the ovary, degenerates to such an extent as to render impregnation impossible. Some modern physiologists believe that the normal site of impregnation is in the cavity of the uterus itself.

In the lower animals spermatozoa have been found in all parts of the Fallopian tubes, and on the surface of the ovaries, and even in the latter; and, as I have already stated, they reach their sites mainly by their own inherent movements. While impregnation is facilitated by penetration and the ejectment of the semen into the upper part of the vagina, and against the orifice of the cervix uteri, yet it may take place when the seminal fluid is simply deposited on the exterior of the vulva.

The long unsettled question as to the method of impregnation by the spermatozoa has apparently been decided by the observations of Meissner and Barry, and others, who have found spermatozoa within the external membrane of the ovum in rabbits. After penetrating into the cavity of the ovum they disintegrate and mingle with and vitalize its yelk. It is inferred that the same vitalizing process takes place in the human ovum.

Time Required by Impregnated Ovum to Reach the Uterus.—The length of time required by an impregnated ovum to reach the uterus varies in different animals, and even in the same animal. The average time in the human female is *about two weeks*. It has never been known to be less than *ten days*.

Primary Changes in the Ovum.—The ovum undergoes many interesting changes a short time before, and immediately after impregnation, and during its journey to the uterus. Physiologists have been enabled to study by the aid of the microscope these changes in such of the lower animals as have sexual systems the most closely allied to those of human females, and by this means to complete the links in the chain of facts forged from the furnace

of observation upon the human female herself. I shall describe only a few of the most important of these mutations.

The granular cells surrounding the ovum immediately after its passage into the Fallopian tube soon disappear, leaving the *zona pellucida*, or external layer of the ovum, without any covering (Fig. 25). The granular cells, it will be remembered, are derived from that portion of the granular membrane of the Graafian follicle called the *proligerous disk*. It is considered very doubtful whether the human ovum in its passage along the Fallopian tube ever has deposited on its surface anything analogous to the white of the egg, as found in birds. However, many authors assert that

FIG. 25.

Formation of the "Polar Globule." 1. Zona Pellucida, containing Spermatozoa. 2. Yelk. 3 and 4. Germinal vesicle. 5. The Polar Globule.

this albuminous deposit actually occurs after the disappearance of the granular cells, or about the time of the arrival of the ovum half way down the Fallopian tube. As such of the granular cells as are not rubbed off by friction on the tube are supposed to afford nourishment to the ovum during the first part of its passage along this canal, so the albuminous layer is believed to be used for the same purpose during the remainder of the journey of the ovule towards the uterus, and for a short time thereafter.

The *germinal vesicle* is one of the first things to disappear without fulfilling any of those great expectations indulged in by the older physiologists. Its disappearance is not necessarily connected with impregnation, but indicates complete maturation of the ovum. The new *embryo cell*, however, which takes its place in many of the lower animals, and possibly also in the human female, is believed to be the result of impregnation. As the germinal vesicle disappears either just before or after the passage of the ovum into the Fallopian tube, whether impregnation has occurred or not, it is im-

possible to determine what relation, if any, the embryo cell bears to the vesicle.

Segmentation of the Yelk.—The yelk next begins to contract, and leaves a little space at one point between it and the investing *zona pellucida*, called the "*respiratory chamber*." Next follows a series of changes known as the *segmentation*, or *cleavage* of the yelk, which results in the development of the blastodermic membrane from which the embryo is formed. This remarkable change in the yelk is preceded by the formation at a point of its surface of what is known as the "polar globule," which is transparent, very minute, and of a bluish tint, and adheres to the inner surface of the zona pellucida. The segmentation of the yelk begins at the site of this globule. It is there also that the head of the fœtus is subsequently placed. The first step in the cleavage of the yelk is a division into two equal halves (Fig. 26). At the same

Fig. 26. Fig. 27. Fig. 28.

Successive Stages of the Cleavage of the Yelk.

time the "*embryo cell*," or "*vitelline nucleus*," or "blasticle," separates into equal parts, one of which becomes a centre for each of the yelk halves. A subdivision of each of the latter, together with its portion of the embryo cell, immediately occurs (Fig. 27); and this process is repeated until the entire yelk is divided into a great number of spheres, each of which has its portion of the *embryo cell* (Fig. 28). The yelk at this stage of the process bears a striking resemblance to a mulberry, and has therefore received the name of the *muriform body*. It is also termed the germ-mass. Some authors believe that although the segmentation of the yelk commences in the Fallopian tube, it does not end until after the ovum reaches the uterine cavity, where the process is completed; while others, with more plausibility, contend that the cleavage begins within half a day from the time the ovum enters the tube, and ends just before or about the period of its reaching the uterus. After a completion of the subdivision of the yelk, its separate

spheres become changed into cells, which, uniting by their edges, form a continuous membrane. The latter, owing to the distension of the *muriform body* by fluid in its interior, is expanded until it forms a complete lining to the *zona pellucida*, and then receives the name of *blastodermic membrane*, from which the entire organization of the embryo is developed.

The ovum having about this time arrived in the cavity of the uterus, the blastodermic membrane, which forms for it a complete spherical lining between the zona pellucida and the yelk, divides into two layers—the external being called the *serous*, and the internal the mucous layer, and a third, or *vascular* layer, is subsequently formed between these two.

The *serous* or *external layer* of the blastodermic membrane is called the *epiblast*. From it are formed the great nervous centres, the epidermis, the main portions of the ear, nose, and eye, a layer of the yelk-sac and amnion, and probably the outer layer of the permanent chorion.

From the *mucous* or *internal layer* or *hypoblast* are developed the deep layer of the allantois and yelk sac, the epithelial lining of the ducts of the glands connected with the alimentary canal, the epithelial lining of the canal itself, excepting that of the mouth, and the epithelial lining of the lungs.

The *middle* or *vascular layer* or *mesoblast* gives origin to the vascular layers of the allantois, amnion, and yelk sac, and in general to all parts of the skeleton, fascia, tendons, muscles, the fibrous and muscular coats of the alimentary canal and other visceral passages, the peripheral nerves, the serous membranes, the parenchyma of many glands, and the genito-urinary system.

The Primitive Trace.—We next observe a thickening of the blastodermic membrane by aggregation of cells. The thickened part is denominated the *area germinativa*, in the centre of which is found a shallow groove lying lengthwise, denominated the *primitive trace*, or first trace of fœtal development, and the earliest indication of the cerebro-spinal canal, surrounding which is an oval space filled with a number of cells more translucent than those found in the rest of the area germinativa, and hence denominated the *area pellucida*.

Two lateral eminences soon arise, one on each side of the primitive trace, known as the *laminæ dorsales*, which, uniting posteriorly, form a cavity within which the cerebro-spina

afterwards developed. These ridges also unite in front to form the abdominal and thoracic cavities, which inclose parts of the serous layer of the blastodermic membrane, as a basis for the development of the serous membranes of the body.

The very small embryo as yet gives but few indications of its future importance as it lies curved on itself, with its concavity inwards, presenting at one extremity a slight thickening, to indicate the caudal end of the fœtus, and a more marked thickening at the other end, which is afterwards developed into the cephalic extremity of the fœtus. It bears at this stage a striking resemblance to a curved gutter. Its external surface is continuous with the serous or external layer of the blastodermic membrane. Its zona pellucida has become much thinner, and the albuminous coating has disappeared.

THE AMNION.—Very soon after the formation of the embryo the *amnion* commences to be developed out of the serous layer of the

FIG. 29.

Development of the Amnion. 1. Vitelline membrane. 2. External layer of blastodermic membrane. 3. Internal layer forming the umbilical vesicle. 4. Umbilical vessels. 5. Projections forming amnion. 6. Allantois.

blastodermic vesicle, and to be projected in the form of two hollow processes, one from its caudal and the other from its cephalic extremity, around the posterior part of the embryo in opposing directions, until the two projections meet and form a union. These processes also gradually arch over the anterior or ventral surface of the fœtus, and gradually approach each other and blend with the integument at the future point of insertion of the umbilical cord (Fig. 29). The amnion thus forms a complete serous envelope
tus. which floats in the fluid, called *liquor amnii*, by
ic is gradually more and more distended.

The *liquor amnii* is essential to the development of the fœtus, not by furnishing it to any great extent with nourishment, but by giving it mechanical protection and support. There is a great variation in the quantity of this fluid—sometimes amounting to only a few ounces, and again to several gallons. Its real quantity gradually augments during the whole time of pregnancy; but relatively to the size of the fœtus it may be said to increase only during the first four and a half months of gestation, and to diminish afterwards.

Were it not for the protection given to the fœtus by this liquid it would soon be destroyed by shocks or other violence; and during the latter patt of gestation, and especially during labor, its umbilical cord would be compressed so as to endanger its life. The distended amnion, as will be found hereafter, also assists during parturition in protecting the child from the too early pressure of the contracting uterus upon its surface. At this critical time it aids materially in the safe dilatation of the os uteri. Some authors believe that the facilities it affords the fœtus to exercise its gradually developing limbs are also of great importance. It is of great service to the obstetrician in turning, especially by external manipulation.

This fluid is composed of water, holding in solution a small proportion of salts and albumen. When first formed it is limpish, but becomes more turbid, of a darker color, and of a greater specific gravity towards the end of pregnancy.

Umbilical Vessel and Vitelline Duct.—At the same time that the amniotic processes are approaching each other on the ventral and dorsal surfaces of the embryo, the internal or mucous layer of the blastodermic membrane gives off two projections (one at each extremity of the embryo), which finally meet anteriorly, and thus divide the blastodermic vesicle containing the yelk into two portions, the smaller of the two, or embryonic portion, eventually being developed into the intestinal canal of the fœtus, while the larger constitutes the ephemeral structure, called the *umbilical vesicle*, from which the embryo at first derives the larger part of its nourishment. The constricted part between the umbilical vesicle and the embryonic portion of the blastodermic vesicle is termed the *vitelline duct*. Both the latter and the umbilical vesicle have, branching over them, an artery and vein, the *omphalo-mesenteric*. The contents of the umbilical vesicle are co

embryo through the vitelline duct and the omphalo-mesenteric vessels.

After the formation of the allantois, and the embryo has converted to its development all the yelk, the umbilical vesicle being of no further use shrinks up and generally disappears; although a small part of its remains, called the *vesicula alba*, sometimes is found several months afterwards. However, in most mammalia no trace of it can be found after the fourth month.

THE ALLANTOIS.—This ephemeral structure arises, according to the best authorities, in the form of a small vesicle from a point near the caudal extremity of the embryo about three weeks after conception. According to Quain its deep layers are formed from the internal or mucous layer of the blastodermic membrane. At first superficial and subsequently pyriform in shape, it gradually becomes more and more constricted near the centre, and finally is

FIG. 30.

1. Exo-chorion. 2. External layer of the blastodermic membrane. 3. Allantois. 4. Umbilical vesicle. 5. Amnion. 6. Embryo. 7. Pedicle of Allantois.

divided into two cavities, communicating with each other, the smaller one giving rise essentially to the urinary bladder (this is doubted by some); while the other leaves the cavity of the abdomen along with the vitelline duct, and proceeds to the *chorion*, over the internal surface of which it spreads itself (Fig 30). The cord or ligament leading from the bladder to the umbilicus, known as the *urachus*, is supposed by some authors to be the remains of the allantois.

ars to form a support or guide to the umbilical

vessels in their first development, in communicating with the inner surface of the chorion. Thus it is seen that it really has, besides giving origin to the bladder, a very important part to play in providing the embryo with the means of circulation and respiration. When that is accomplished it disappears as rapidly as it was formed.

THE CHORION.—Having already described the *amnion*, or internal fœtal membrane, I shall next call attention to the *chorion*, or the external of the truly fœtal membranes; I say external of the truly fœtal membranes, for, although the *decidua* is external to it, its origin is not from the ovum, but from the mucous membrane of the womb.

The chorion begins to make its appearance about two weeks after impregnation, and is formed from the external or serous layer of the blastodermic membrane.

FIG. 31.

An Embryo of about twenty-five days, laid open (after Costa). *a*. Chorion. *b*. Amnion. *c*. Cavity of Chorion. *d*. Umbilical Vesicle. *e*. Pedicle of Allantois. *f*. Embryo.

It is a closed sac, having a shining and smooth internal surface. When first formed in the Fallopian tube its external surface also is smooth, but by the time of its arrival in the uterus, or very soon thereafter, it is covered all over with little hollow projections, like the fingers of a glove in shape, but hairlike in thickness, called villi, which, after full development, give to the chorion, when placed in water, a shaggy or woolly appearance (*a*. Fig. 31). At first the villi are simply straight tubes with blind extremities, imbedded in the decidua like the spongioles or rootlets of plants, without bloodvessels, and endowed with the capacity of absorbing nutriment from the surrounding tissues by endosmosis. But some time during the second month of gestation a vascular sac, termed the allantois, spreads itself all over the inner surface of

the chorion, and supplies the cavity of every villus and its subdivisions with capillary vessels, which are brought into intimate relations with similar vessels in the decidua. The villi now lose the character of simple straight tubes, throw off branches and convolutions, and become largely developed; but after two months they commence to atrophy, and gradually disappear, except where brought into apposition with the *decidua serotina*, where they become enormously hypertrophied and convoluted, and form the chief part of the fœtal surface of the placenta.

When the true chorion, just described, is developed, the primitive chorion, formed by the *zona pellucida* and its *albuminous coating*, disappears by absorption.

During the early months of pregnancy the internal face of the chlorion does not lie in contact with the amnion, the intervening space being occupied by the umbilical vesicle and an albuminous liquid, but by the faster development of the amnion the two membranes are soon brought into apposition all around, and become blended into a single sac.

In the formation of the placenta the external surface of the chorion is blended with the fœtal surface of this organ, and is reflected from its margin on to the internal face of the decidua reflexa.

The Decidua.—While the ovum is descending the Fallopian tube and undergoing a part of the changes already detailed, the stimulus of impregnation gives rise to very important changes in the mucous membrane of the uterus itself to fit it for the reception of its future guest. This membrane becomes vascular, and thickens to such a degree that it actually fills the entire cavity of the uterus, and thus affords a safe anchorage for the impregnated ovum until the latter, by further development, assumes more intimate connections with the former.

Embryologists have a great deal to say concerning the *decidua* and its subdivisions of *decidua vera*, *decidua reflexa*, and *decidua serotina*.

There are two principal theories in regard to these structures. The older one, propounded by the renowned John Hunter, and adopted by the great majority of physiologists of the early part of the nineteenth century, was, briefly, that the decidua was an exudation of the nature of coagulable lymph, formed by the stimulus of impregnation on the inner or free surface of the entire mu-

reflexa, but simply lodges in one of the folds of the hypertrophied mucous membrane lining the cavity of the womb, and undergoing a transformation into the decidua, not behind this muco-deciduous membrane, but merely in one of its folds. How then is the *decidua reflexa* formed? By the sprouting up around the free surface of the ovum of projections from the muco-deciduous membrane (Fig. 33). These projections meet in the centre, and the evolution is complete. According to this view, which is adopted by nearly all physiologists of the present day, there is no stripping of the recently-formed decidua from any portion of the womb to form a *decidua reflexa*, and no subsequent exudation upon the part thus denuded for the development of a *decidua serotina*.

Although the latter name was given by Bojanus to the membrane situated between that part of the ovum and the future site of the placenta, under the false theory of its being a later production than the decidua vera, it has been found convenient to retain it.

The decidua becomes thinner and thinner as gestation advances, and, during the latter months of pregnancy, undergoes fatty degeneration to prepare it for shedding after labor. Whether it separates wholly, or only in part, after parturition, is still an unsettled question. The most distinguished of modern authorities affirm that the greater portion of its thickness peels off, leaving a thinner layer as a basis for the formation of a new mucous membrane.

The convex surface of the decidua reflexa is not at first in contact with the concave surface of the decidua vera, but the two surfaces approach nearer and nearer in proportion to the development of the ovum, until they not only come in contact, but, the two layers unite into a single membrane about the end of the third month.

Nourishment of the Embryo.—During the earliest period of the development of the *ovum* it receives its nourishment directly from the contents of the umbilical vesicle, through the communication existing between the latter and the intestinal canal. Afterwards it is probably supplied through the medium of the omphalo-mesenteric circulation, and next by the functions of the *chorion* and *decidua*. The chorion absorbs through the root-like branches of its numerous *villi* the necessary pabulum from the decidual membrane into which they plant themselves. But the chief and

last supply of nutriment to the fœtus while in utero is from the organ to which I shall next invite attention.

The Placenta.—This structure not only furnishes from maternal sources the necessary liquid food to the fœtus during two-thirds of its uterine existence, but is also the organ for aerating its blood. It is, therefore, the most important of all the fœtal appendages.

But before speaking of its physiology it is proper that I should give an outline of its anatomy.

Its name, signifying a cake, was derived from its shape. It varies greatly in arrangement and shape in the different classes of mammalia. In the human female it is found in the form of a flat, circular mass, attached to any part of the uterine cavity, but generally in the vicinity of the orifice of one of the Fallopian tubes. It is sometimes situated over the internal os uteri, and then gives rise to frequent, and often dangerous attacks of hemorrhage, as will be seen when the subject of *placenta prævia*, the name by which this situation of the placenta is designated, comes under consideration. We may generally tell after the expulsion of the placenta whether our diagnosis as to its situation in the womb was correct or not, by examining the fœtal membranes attached to it, as the opening in them corresponds to the os uteri.

The commencement of the formation of the placenta is towards the end of the second month of pregnancy. Its dimensions are gradually increased until the period of parturition.

A fully developed placenta after its removal from the body is a soft, spongy, cake-like, circular mass, and on an average from six to eight inches in diameter, three-quarters of an inch thick in the centre, and one-fourth of an inch thick at its margin, and about twenty-one ounces in weight. It has a smooth internal surface (Fig. 34), which is lined by the fœtal membranes, which are reflected from its circular margin in a bladder-like form, constituting before rupture the bag of waters, which plays so important a part in parturition, as I have already stated, and as I shall hereafter describe more fully. These membranes are also reflected from the placenta on the umbilical cord, which is generally attached near the centre of its internal or fœtal surface, over which the umbilical vessels may plainly be seen to divide into numerous branches before sinking into the deeper structures beneath. The battledore placenta has the umbilical cord attached to its edge. The external

or maternal surface of the placenta (Fig. 35), is very different from the internal or fœtal; being rough and granular, and divided by numerous sulci into many small lobes of from one-fourth of an inch to an inch and a half in diameter. It is covered, as will be seen on a careful examination, by a delicate membrane—the cellular layer of the decidua serotina—which unites the lobes together and dips down between them into the sulci, somewhat similar to what the piamater does between the cerebral lobes. By floating the placenta in water the oblique passage of the torn uterine veins and curling arteries may be seen on its external surface. The placenta possesses a fœtal, and a maternal portion, the former

FIG. 34. FIG. 35.

FIG. 34.—The Internal or Fœtal Surface of the Placenta.
FIG. 35.—The External or Maternal Surface of the Placenta.

being chiefly composed of hypertrophied chorionic villi and their enclosed vessels, through which the fœtal blood is transmitted and brought into intimate relation with the maternal blood, which lies in the cavities of the maternal portion of the placenta. It is proper to state, however, that there are many physiologists who deny that the maternal blood is conveyed into the placental cells or sinuses, and affirm that it never passes into the placenta at all, but is only brought into a close relationship with the fœtal blood.

Nevertheless it is almost universally agreed by all parties that, in accordance with Hunter's opinion, there is no direct communication between the maternal and the fœtal circulation. Those who believe in the placental sinus theory, affirming that the chorionic villi in dipping into the maternal blood contained in the sinuses, push before them a cellular membrane, thus separating the maternal from the fœtal blood by this membrane and the walls

of the villi themselves, while the opponents to the sinus theory, although differing among themselves, admit that there is always at least, the parietes of the chorionic villi intervening between the maternal and fœtal blood.

The maternal part of the placenta is developed from the *decidua serotina* and the maternal bloodvessels.

There is no direct vascular communication between these two sides of the placenta, as has been proved by the failure of injections to pass from one side to the other by microscopic observations, and by the fact of the fœtal being much more rapid than the maternal circulation. An additional proof is furnished by the great differ-

FIG. 36.

Diagram representing a Vertical Section of the Placenta (after Dalton). *a. a.* Chorion. *b. b.* Decidua. *c. c. c. c.* Orifices of uterine sinuses.

ence in the quantity of the albumen and fibrin, and the relative number of the red corpuscles, as found in the fœtal and parental blood. Although there is no direct vascular communication between the two sides of the placenta, the anatomical arrangement of the parts is such as to afford a most intimate indirect relation between them. Each branch or digitation of the chorionic villi contains an arterial and venous twig communicating with each other by a loop of capillaries. These ultimate ramifications of the villi containing the capillary loops dip into the maternal blood found in the sinuses or cavities of the uterine side of the placenta (Fig. 36), and by absorption take up the essential elements of this

fluid, which is transmitted by the capillary tufts to the small venous branches, and then to larger ones, and further on to the main umbilical vein which, together with the two umbilical arteries, forms the umbilical cord. Thence it proceeds to the fœtal heart by which it is forced into the entire fœtal system, affording nourishment to the fœtus, and is returned by the two umbilical arteries in the form of venous blood to the minute ramifications of the villi again, where it is oxygenated and is commingled with new sanguineous material from the mother, as at first. So it is seen that the placenta is both stomach and lungs to the fœtus.

I should also state that the cavities or sinuses on the maternal side of the placenta receive their blood from the uterus by means of crooked vessels, called curling arteries, and that this blood is collected from them by the uterine sinuses.

Although the structure of the maternal portion of the placenta just described is in accordance with the general views of the most eminent physiologists, yet Dr. Braxton Hicks and others have lately denied a sinus system to the placenta. The blood passing from the placenta to the fœtal heart is really arterial blood, although transmitted in a vein; and on the other hand the blood returned to the placenta from the fœtus through the umbilical arteries is venous blood. This anomaly is somewhat confusing to the student, and arises from the fact that the nomenclature of the anatomist which sometimes differs from that of the physiologist is here applied. The anatomist calls every vessel an artery that carries blood from the heart, and every bloodvessel a vein that leads towards the heart.

A similar anomaly is found in the pulmonary artery and veins of persons after birth—the former transmitting venous blood from the right ventrical of the heart to the lungs, and the pulmonary veins returning arterial blood from the lungs to the left auricle.

Fatty Degeneration of the Placenta.—Although fatty degeneration is unquestionably very often a pathological condition, it is not strictly correct to call those changes in the placenta just previous to its expulsion from the womb morbid processes, unless those analogous changes in the uterus itself after parturition, when it is returning to its normal condition, be considered as pathological in character. The changes which the placenta undergoes preparatory to expulsion consist in a fatty degeneration of the decidual layer between it and the uterus, and of the chorionic villi, together

with a deposit of calcareous matter on its uterine surface. This degeneration may become pathological when carried to excess, as is sometimes the case, because it may thus deprive the fœtus of a sufficient number of healthy *villi* for the purposes of nutrition and respiration.

THE UMBILICAL CORD.—Having already incidentally described the main features of the umbilical cord I have only to add a few additional remarks concerning it. It consists, when fully developed, of one *umbilical vein* and two *umbilical arteries*, imbedded in a quantity of transparent gelatinous material called Wharton's jelly—all surrounded by an external membranous sheath, formed from the amnion. In addition to these structures the cord in early embryonic life contains the pedicle of the umbilical vesicle. It also has at this period two umbilical veins, one of which soon disappears from atrophy.

The average length of the cord is about twenty-one inches, but in rare instances it has been found not over five inches, and again measuring about five or six feet. In the summer of 1878 I delivered, in Portland, Oregon, Mrs. James Cummings of a large male child, having a cord five feet and ten inches in length. It is usually about as thick as the little finger. In opposition to the assertions of a few physiologists it is almost universally believed that there are no nerves or lymphatics in the umbilical cord. In the beginning its vessels are straight, but soon become twisted like the handle of a willow basket—the arteries being on the outside of the vein. It is a curious and unexplained fact that this twist is almost always in one direction. But while Leishman and others assert it to be from right to left, Tyler Smith, Meadows, Playfair, and Salvia declare it to be from left to right. The confusion or contradiction may probably arise from the manner of tracing the twist. If the practitioner held the cord at right angles to his body and the twist be traced outwards it will nine times in ten be *from right to left;* but if held in the same manner and the twist be traced in an opposite direction it will nine times in ten be *from left to right.*

The vein contains no valves, as its tortuous course compensates for the absence of the latter. The arteries give off no branches, while in the cord, but increase in size on reaching the placenta, just before dividing into branches, which spread over and dip into this organ. The cord is sometimes found with knots, which are,

however, rarely sufficiently tight to obstruct the circulation. These are supposed to be formed by the movements of the fœtus when very small, and occasionally, even, in labor, by the child passing through a coil of the cord lying around the mouth of the womb. One end of the cord is attached to the fœtus at the umbilicus, and the other to the placenta. It is the channel of communication between the two. The cord first makes its appearance about the fifth week of pregnancy. Previous to this time the ovum is connected with its envelopes by its lower extremities. When first formed it is short and thick; its vessels being straight instead of spiral. They do not assume the latter condition until the end of the second month, when the cord has become several inches in length. It floats around loosely in the liquor amnii, almost from the period of its development until the end of gestation.

CHAPTER VI.

THE DEVELOPMENT AND ANATOMY OF THE EMBRYO AND FŒTUS.

ALL nature is full of mystery and wonder. But there is nothing more mysterious, and nothing more wonderful, than the rapid development of embryonic man. In the brief period of nine months a cell, so small as to be invisible to the unaided eye, becomes developed into a complex and living machine, surpassing all efforts of imitation by the most ingenious of the sons of men.

There is so much in this subject of deep scientific interest that it is really a difficult task to cull only the things most essential for the student of medicine. Still, this must be done; so far, at least, as it is in my power to do so.

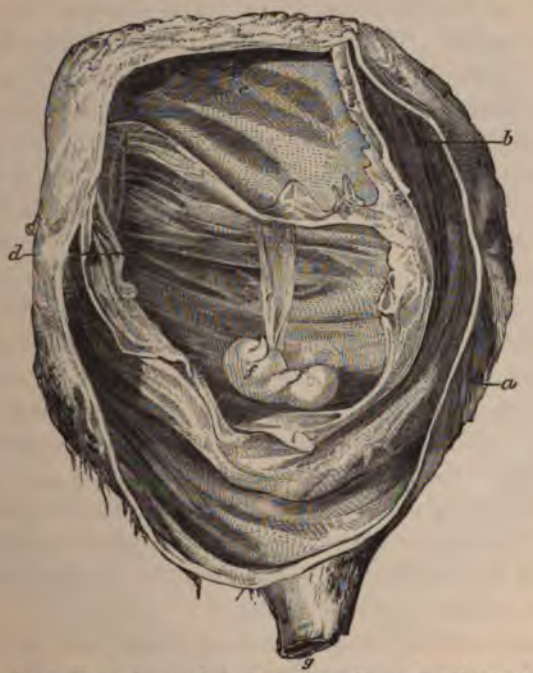
The terms embryo and fœtus are not synonymous, usage applying the former to the product of conception up to the end of the third month, and the latter from that period until the termination of gestation. I shall not, however, conform very strictly to this merely technical distinction. The study of embryonic and fœtal development of the human subject is beset with so many difficulties that we have to depend mainly on the aid afforded us by comparative anatomy and physiology for the solution of the greater part of its difficult problems. Yet the most reliable facts are only to be obtained by examinations of the embryo after abortions, or, better still, of the bodies of women who die in the different stages of pregnancy. From information gained in these various ways we are enabled to form, in any given case, an approximate estimate of all the really practical questions presented for our determination. It is often of the utmost importance for the practitioner to know from the appearance of an aborted embryo or fœtus its probable age. I shall, therefore, endeavor to describe briefly the chief features of the fœtus at each month of its development.

1*st Month.*—The embryo at the end of the first month after fecundation is distinctly visible as a minute and semi-transparent, indefinite, gelatinous structure, with a line of demarkation dividing it into two portions, the larger and more spherical of which indicates the future head, and the smaller and more conical its

body. Its length is about four lines, and weight about two grains. It is slightly curved, having an anterior concave, and a posterior convex surface. The pedicle of the umbilical vesicle may be observed in its unclosed abdominal cavity, and the embryo is, even at this early age, surrounded by the amnion, which, however, does not invest it very closely.

2*d Month*.—During the latter part of the second month, the cephalic portion of the embryo becomes considerably developed, and

FIG. 37.



Membrana Decidua, with an Ovum of about seven weeks. *a*, Decidua vera; *b*, Decidua reflexa; *c*, Chorion; *d*, Amnion; *e*, Umbilical cord; *f*, Embryo; *g*, Membrana decidua, extending into the neck of the uterus. (After Hodge.)

its features are indicated by rudimental spots, and the extremities by rudimental projections from the body (Fig. 37). By the end of the second month the development of the features, and of the internal and external organs, has advanced considerably. Its weight at this period is about half an ounce, and its length twenty-one lines. Rudimentary external organs of generation make their appearance about this time, but the extreme length of the clitoris renders a differentiation of the sexes almost impossible.

3d Month.—At the expiration of the third month its external and internal organs are almost fully formed; it weighs about three ounces and a half, and measures from four to six inches. The nails begin to form. The sexes are differentiated; the forehead and nose can be recognized; the lips are well marked; the eyeballs are seen through the lids; the skin is very thin, transparent, and without a fibrous structure, and of a roseate hue.

4th Month.—At the end of the fourth month hair commences to make its appearance on the head in the form of a slight down. The length of the fœtus is about seven inches and its weight about nine ounces The sutures and fontanelles are large. There frequently is, at this period, a muscular activity of the fœtus, called "quickening," which may be felt by the mother at three months and a half, or not until the expiration of five months. The average period of its manifestation is not four and a half months as formerly supposed, but sixteen or seventeen weeks. The mouth, nostrils, and eyes are not yet open. It is possible for a fœtus born at this period to remain alive for several hours.

5th Month.—At the termination of the fifth month these movements of the fœtus are generally very strong, and should there be a miscarriage at this time, respiration might be established for several hours, although the fœtus is not regarded as "viable" until the end of the sixth month. Cases have occurred, however, where the child has survived when born during the twenty-third week. The pupils are not yet distinguishable. The nails begin to form. Its weight at the end of the fifth month is eleven ounces, and its length ten inches, and its head constitutes one-third of its entire length (Fig. 38).

6th Month.—At the end of the sixth month the hair assumes a darker color; eyelashes are formed; the membrana pupillaris is developed and the eyelids are closed; adipose matter has commenced to be deposited beneath the skin, and the pubic bones have begun to ossify. Its weight is one pound and length about twelve inches.

7th Month.—At the expiration of the seventh month the fœtus measures from 13½ to 14½ inches, and weighs from 2½ to 4 pounds, the testicles begin to descend into the scrotum and the eyelids to open, and the pupils are formed. It is generally asserted that the pupillary membrane disappears about this time, but according to Mr. Jacob, it never disappears entirely until after the birth of the

child. Mr. Valpean denies the existence of this membrane at any period of intrauterine life.

8th Month.—At the end of the eighth month the fœtus measures about eighteen inches in length, and weighs from four to five and

FIG. 38.

Ovum of about five months. *a*. Portion of Membrana Decidua. *b*. Placenta. *c*. Chorion. *d*. Amnion containing Fœtus. (After Hodge).

a half pounds; it has an abundant deposit of subcutaneous fat, and is in many cases well developed. The nails are fully formed.

9th Month.—On the birth of the child at the expiration of the ninth month it usually measures from the apex of the head to the heels from 19 to 24 inches, and weighs about seven and a quarter pounds avoirdupois. Playfair states the average weight to be 6½ pounds. The weight varies somewhat in different countries. I have had an extensive obstetrical experience in Cali-

fornia and Oregon, and have seen a great many infants weighed at birth, and I feel sure that the average weight in these States is at least eight pounds avoirdupois.

The eyes of all infants at birth have a peculiar dark steel-gray color and the hair is generally dark. The color of both the latter and the former usually changes sometime afterwards.

Both testicles have generally descended into the scrotum. We have generally been told that at the full term the umbilicus marks the middle point of the body, but according to the observations of Moreau and Olivier d'Angers, the umbilicus is found about three-fourths of an inch below the centre. At the full term, or expiration of the ninth month, the fœtus is fully developed, having not only the organs of vegetable life in full perfection, but also those of animal life. The latter remain passive until the birth of the child, when they spring suddenly into activity.

The measurements and weights given are intended to denote only an approximate average. The true ones are quite variable even in the same sex, and the sexes mark a difference in themselves; the size of the male sex usually being larger than the female by half an inch in length, and corresponding thickness. The male child also averages about ten ounces more in weight.

Twelve pounds is a very great weight for a new-born child, but there are few practitioners of much experience who have not seen one or more instances of this weight. Dr. Ramsbotham gives an account of a fœtus weighing 16½ pounds, and Cazeaux of one reaching the enormous weight of eighteen pounds, and alludes to another which was said to have weighed 19½ pounds, but he did not see the latter weighed. Dr. A. P. Beach, of Seville, Ohio, reports to the Medical Record, March 22d, 1879, the case of a new-born child weighing 23¾ pounds, which is said to be the heaviest infant at birth on record. The mother, whose maiden name was Annie Swan, of Nova Scotia, stands seven feet nine inches in height. Her husband, Captain M. V. Bates, formerly of Kentucky, is seven feet seven inches high. Captain and Mrs. Bates are well known to the public, having been exhibited as giants in Europe and America. Mrs. Bates had hydramnios coexistent with general dropsy. The liquor amnii amounted to about six gallons. The labor was difficult, but the child was safely delivered. Measurement—30 inches in height, 24 inches around the breast, 27 inches at the breach, the head 19 inches, and

the feet 5½ inches in length. The secundines weighed 10 pounds, the mother made a good recovery. No one at present believes the old fabulous statements of new-born children weighing as much as forty pounds, and measuring four feet in length.

On the other hand, many children at birth fall much below the average weight and length given above.

THE POSTURE OR ATTITUDE OF THE FŒTUS IN THE WOMB.—In the following remarks upon the posture and attitude of the fœtus in the womb, it is not my intention to explain fully at this time the

FIG. 39.

The Usual Position of the Child in the Womb.

different kinds of *positions* and *presentations*, and their technical meanings, as this part of the subject can be more understandingly considered hereafter.

The fœtus, in the great majority of cases during the last few months of pregnancy, lies in the womb with its head downwards and with its body bent so that its spine presents an outward convexity; its legs are flexed on its thighs and the latter on the abdomen; the feet are bent on the legs in such a manner as to leave the heels lower than the toes; the forearms are flexed on the arms and lie near together on the anterior part of the chest, and the chin rests on the sternum (Fig. 39). In this posture the fœtus adapts itself to the shape of the uterine cavity, which is largest at the fundus and narrowest at the cervix. The opinion

of the ancient physicians, which prevailed indeed until the middle of the last century, was that the head of the fœtus was uppermost until the period of parturition, and that the occipital presentation was brought about at the termination of pregnancy by a sudden movement of the fœtus. This belief is now known to be erroneous, as it has been fully proved, by many observations, that this is, in the great majority of cases, the posture of the child during all the latter part of gestation. Changes in posture, are, however, more common than generally supposed, as has been shown by the investigations of late observers. These changes are mostly in the latter months of gestation, and form non-cephalic to cephalic presentations. In premature delivery there are fewer presentations of the head than in delivery at the proper term. This is also the case where the fœtus is dead, as has been proved by statistics, especially those of Dr. Collins. According to his investigations, extending to 15,000 infants, only one in fifty-seven living children presented otherwise than by the head, while in about 500 still-born and putrid children the proportion of non-cephalic presentations was one in every five.

Causes of Cranial Presentations.—The causes of the great frequency of cranial presentations are somewhat obscure, notwithstanding the positive assertions of obstetricians. Ever since the time of Smellie it has been maintained by the profession generally that *gravity* was the chief, if not the only cause; that as the fœtus floats in the liquor amnii, its occipital extremity would, from its preponderant weight, naturally gravitate towards the lower part of the uterus.

This apparently very simple explanation of the subject was denied by the celebrated French obstetrician, M. Paul Dubois, in 1833, and subsequently by Simpson and other distinguished observers, but without any agreement among themselves as to their grounds of objection, or in their theories as to the true cause of the phenomenon.

One of the objections brought forward by the opponents of the theory of gravitation is the frequency with which other parts than the cephalic extremity present in premature labors, where gravitation ought to exert its influence the same as in labor at full term.

The objection brought forward by Dubois was that, according to his experiments on a fœtus suspended by the umbilicus in a

tub of water, gravitation caused the scapula or back instead of the head to sink down the lowest. He maintained that the true cause of the head generally descending the lowest was owing to the instinctive movements of the fœtus to adapt itself to the most comfortable position in the womb.

As there is no evidence tending to show any such instinctive motions on the part of the fœtus, we cannot place much confidence in this hypothesis.

Simpson, like Dubois, ascribes great importance to the fœtal muscular movements, but denies that they are either voluntary or instinctive, and asserts that they have an excito-motory or spinal origin, being determined by physical irritations on the cutaneous surface of the fœtus by changes in the posture of the mother, and by contractions of the womb. The frequency of other parts than the occipital extremity presenting at the lowest part of the womb in case of the death of the fœtus is in harmony with this hypothesis, as there could then be no physical irritations acting on the reflex-motory system to bring about the movements and consequent cephalic presentations. The objection to Simpson's theory is the want of proof of any such extensive and constant reflex movements of the child in utero as he describes.

Cazeaux believes that the reason for the fœtus generally lying in the womb with the head downwards during the latter months of pregnancy is in order to adapt itself to the conformation of the cavity of the womb. The fundus being the broadest, naturally receives the breech or broader end of the fœtal ovoid; while its narrow conical segment just as naturally receives the smaller or cephalic end of the fœtus.

Dr. Duncan comes to the support of the theory of gravitation by very satisfactorily disposing of the chief objections against it. He maintains that the experiments of Dubois did not properly represent the state of the fœtus in the womb. That when the woman is lying on her back, or standing in the erect posture, the uterus is far from being vertical, that it only assumes this position when her trunk inclines backwards at an angle of thirty degrees with the horizon.

As the matter now stands, the old theory of gravitation may be considered as offering as plausible an explanation of the presentation of the head as any of the newer ones; but there is no necessity of relying solely upon any one of these supposed causes,

for it is highly probable that while in some cases the cause may be gravitation, in others it may be the adaptation of the fœtal ovoid to the conformation of the cavity of the womb, in others, again, it may be a combination of both of these conditions, and in a few instances the union of several causes.

The fact of the cranium presenting in ninety-six out of every one hundred cases is, after all, the only important and practical part of the subject, and this appears to be fully established.

Anatomy of the Fœtal Head.—The anatomy of the maternal pelvis and of the fœtal cranium constitutes the foundation of the science of obstetrics. Having described the former, I shall now call attention to those points in the latter of special obstetric importance. The chief anatomical peculiarity in the fœtal cranium at full term lies in the difference between the development of the bones of its base and of those of the vault. The former are so fused together as to admit of little or no movement, for the physiological purpose, no doubt, of more fully protecting the important structures lying at the base of the brain. The bones of the vault, on the other hand, are not firmly ossified, and admit of more or less motion between their points of union, which consist of membrane or cartilage. There are reasons for this difference of degree in ossification of the base and the vault of the cranium. The chief one being that the upper portions of the great nervous centre are not so essential to life as those at the base, and may, therefore, during labor, admit of more compression, a very essential point as, the vault of the head being of greater dimensions than its base, and being the part of the fœtus first engaged in labor in the great majority of cases, should necessarily be compressible, and susceptible of being moulded to the shape of the maternal pelvis. I should also add that the bones of the face, like those of the base, are more firmly united than those of the vault of the cranium.

A knowledge of the divisions of the cranial bones is essential to enable us to know exactly what position is assumed during parturition by the fœtal head. The bones of the latter are separated by *sutures* and *fontanelles;* the first forming the lines of junction between them, and the last being the membranous interspaces at the junction of the sutures. The main sutures are the *sagittal*, the *frontal*, the *coronal*, and the *lambdoidal*. The *sagittal suture* extends along the top of the head from the anterior to the

posterior fontanelle, and separates the two parietal bones. The *frontal suture* separates the two halves of the frontal bones, and is a continuation of the sagittal suture. The *coronal suture*, its name being derived from the ancient custom of wearing triumphal crowns in that position, marks the divisional line between the parietal and frontal bones; while the name of *lambdoidal suture* is applied to the line of demarkation between the occipital bone and the posterior margins of the two parietal bones. It has a slight resemblance to the Greek letter from which it derives its name.

These sutures have other names, but it is unnecessary to remember more than one name for each of them.

FIG. 40.

Anterior and Posterior Fontanelles.

The *fontanelles* are the interspaces or gaps at the angles of the upper cranial bones or the points of junction of their sutures, and are covered only by membrane on which the scalp rests. These points are, therefore, soft to the touch, and the pulsations of the brain can be seen and felt through them. They are usually described as the anterior and posterior fontanelles (Fig. 40). The former, which is also called the *bregma*, is the larger of the two, and is formed by the junction of the sagittal, the frontal, and the two halves of the coronal sutures. It can easily be distinguished from the posterior fontanelle on account of its greater size and by its shape, which is not triangular like the other, but more like a lozenge. It has four lines of suture running into it, and has four angles, the anterior of which is much elongated, being sometimes projected forwards and downwards almost to the root of the nose.

The *posterior fontanelle* is, as just stated, of a triangular shape and is much smaller than the other one. It has a suture entering each of its three angles. It generally forms a depression admitting only the tip of the finger, while into the anterior fontanelle the ends of two or three fingers may be placed. We may know the sagittal suture by its running into two fontanelles; the lambdoidal, by its continuity being interrupted in its centre by a small fontanelle—the posterior; the coronal, by its course being broken at the centre by a large quadrilateral fontanelle—the anterior.

It is important for the student to bear in mind these points of difference, as they will enable him to make out during parturition what is technically called the position of the fœtus. The occiput being almost always turned anteriorly, the posterior fontanelle is usually the lowest, and therefore the one that is generally first touched during labor. If therefore in a vertex presentation the posterior fontanelle points towards the left foramen ovale, and the sagittal suture can be traced obliquely backwards to the right sacro-iliac synchondrosis, we not only know that the long or occipito-frontal diameter of the head lies in the right oblique diameter of the pelvis, but that the fœtal head occupies the first, or left occipito-anterior, position.

If the occiput points to the right foramen ovale, and the sagittal suture occupies the left oblique diameter of the pelvis, the vertex is in the second, or right occipito-anterior, position.

This subject will be more fully explained under the head of presentations and positions of the fœtus. In a well-developed fœtal cranium the posterior fontanelle is sometimes so small as to be unrecognizable except from the fact of its being the point of junction of the sagittal and lambdoidal sutures. This is particularly the case in overlapping of the cranial bones from compression during parturition.

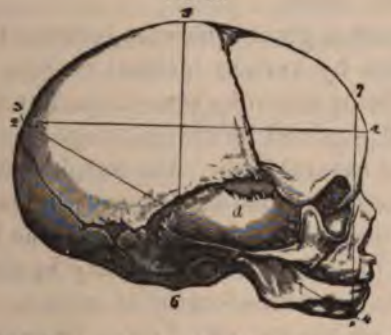
It is frequently difficult or impossible to make out the different sutures and fontanelles while the membranes remain unbroken; and even afterwards, if the head has been subjected for a long time to great compression, so as to create tumefaction of the scalp and overlapping of the bones. In truth, under these embarrassing conditions even the presenting head itself may not be recognized. I have already stated that these sutures and fontanelles allow the fœtal head to be moulded into a shape adapted to the maternal pelvis. Under these circumstances the parietal bones overlap each

other considerably; and the head, especially when there is in addition a large tumefaction of the scalp, sometimes becomes in difficult labors so misshapen that the poor mother is brought to tears, because she believes her darling is deformed. But a few days make all things right again.

It is hardly necessary to inform the reader that the sutures and fontanelles commonly become ossified in a few months after the birth of the child; but the anterior fontanelle sometimes remains in a soft condition for two or three years. I have several times in the course of my experience been called hurriedly to see children, whose heads the inexperienced nurse or mother supposed were broken, when the origin of the fright was traced to the fact of the fontanelle not having been ossified.

Diameters of the Fœtal Cranium.—It is just as necessary for the accoucheur to understand the measurements of the fœtal

Fig. 41.



1 and 2. Occipito-frontal diameter. 3 and 4. Occipito-mental. 5 and 6. Cervico-bregmatic. 7 and 8. Fronto-mental.

cranium as of those of the maternal pelvis. Because these dimensions have a direct bearing on the exit of the head through the latter. They are taken from opposing points on the head, and are designated diameters (Fig. 41). The most important are seven in number:

First.—The *occipito-mental*, or *oblique*, extends from the occipital protuberance to the chin, and measures five inches and a quarter.

Second.—The *occipito-frontal* extends from the occiput to the centre of the frontal bone, and measures four and a half to five

—The *bi-parietal*, or *transverse*, measures three inches and

three-quarters, and reaches from one to the other parietal protuberance.

Fourth.—The *cervico-bregmatic* extends from the anterior margin of the foramen magnum nearly perpendicularly upwards to the centre of the anterior fontanelle, and measures three inches and three-quarters.

Fifth.—The *suboccipito-bregmatic* extends from a point midway between the posterior margin of the foramen magnum and the occipital protuberance to the centre of the bregma or anterior fontanelle, and measures three inches and a quarter.

Sixth.—The *bi-temporal* reaches from one to the other ear, and measures three inches and a quarter.

Seventh.—The *fronto-mental* extends from the top of the middle of the forehead to the chin, and measures three inches and a quarter.

These must be considered as the average measurements of normally shaped fœtal crania.

There is, however, a great difference between the lengths of the diameters as given by various medical authors, owing partly to the fact of their being taken by some immediately after birth, before the head had regained its normal shape; and by others after it had resumed its natural form. The occipito-mental and occipito-frontal are the ones most frequently modified during parturition. These diameters may be increased more than an inch in protracted labors, while the bi-parietal diameters may be diminished by compression from a half to three-fourths of an inch.

The Relation of Pelvic and Fœtal Diameters in Labor.—It will be found, when we come to study the mechanism of labor, that the mature child can only be born in a normal pelvis by presenting one or the other end of its long diameters—cranial or pelvic—the latter term embracing the pelvis and the lower extremities. And further, no matter which end presents, the head cannot pass through the pelvic canal with its occipito-mental diameter parallel to the pelvic diameters. Or in other words, that it is impossible for the occiput and chin to enter or pass through the pelvis on the same plane, but one or the other must first engage, or enter the pelvic cavity.

It is also important, though not so essential, that the suboccipito-bregmatic diameter of the head should enter the pelvis in one of

the oblique diameters of the brim. This can only occur when the child's head is strongly flexed upon its sternum.

Influence of Sex and Race on Dimensions of Fœtal Skulls.—The dimensions of the heads of male children are, on an average, greater than those of females by at least an inch in circumference. Their crania are more fully ossified. This is probably the main reason why there are more stillborn males than females, and why the deaths among mothers are proportionately more numerous in labor of males than of the opposite sex. The proportion of still-born boys to still-born girls is, according to Sir James Y. Simpson, as 151 to 100. It is also probable that the fœtal heads of the highly cultivated races are, on an average, of larger dimensions than the savage or uncultivated.

The heads of the Egyptian and Peruvian mummies are much smaller than those of the European races.

The size and development of the Bushman's cranium and brain are far below those of his Caucasian brother.

The shape of the head varies much among different races. From the earliest ages there has always been some tribe or race in the habit of modifying the normal shape. Hippocrates refers to this custom among the Macrocephali, a Scythian race. It is also related that the Caribs flattened the foreheads of their children through so many generations that the flat shape in the course of time became the normal one. The Chinook and Flathead Indians of the United States of America also flatten the heads of their children during the period of infancy.

CHAPTER VII.

FUNCTIONS OF THE FŒTUS.

In a former chapter I had occasion to allude to nutrition of the embryo, and I shall again discuss the subject more in detail as an introductlon to a few remarks on other functions of the fœtus in utero.

Nutrition is an essential function in the development and growth of all organized substances throughout the range of both the vegetable and animal kingdoms. In this broad sense it is a theme of inexhaustible interest. It is not, however, my purpose to consider it in its general application, but only so far as it has any relation to the nourishment of the human embryo and fœtus.

The Purpose and Modes of Nutrition.—We must not imagine that nutrition has for its aim, solely, the growth of the embryo, for, if this were the case, the latter would simply enlarge into an undeveloped mass, without symmetry or beauty, or any of those elements belonging to the most wonderful piece of mechanism in the whole range of God's created works. It is plain there must be other ends to subserve than mere growth, and these are *development* and *repair of waste*. From the simple cell, too small to be seen except by the aid of the microscope, gradually becomes elaborated, new tissue after new tissue, until all the complex organization of a living human being is formed. While growth and development are moving on, by the assistance of nutrition, the natural waste of tissue that occurs constantly in the human system also needs repair, which is accomplished through the exercise of the same function.

There is no period in the life of man when growth and development are comparatively so rapid as during the first half of fœtal existence. Where does the embryo, in its successive stages of growth and development, obtain its nutritive supply? All modern physiologists will reply—of course, indirectly from the mother. But, if we go further, and inquire as to the exact manner this supply is furnished, we call forth many conflicting answers. One thing, however, appears certain, that it cannot, in the successive

stages of the development of the embryo and fœtus, pass through the same channels. The impregnated ovum, prior to the formation of the umbilical vesicle and the allantois, undoubtedly gets its nourishment by absorption or endosmosis through its external membranous covering. But what is its source? Some physiologists will tell us that it is at first derived from the discus proligerus by which the ovum is surrounded, on escaping from the Graafian follicle, and afterwards from the albuminous matter surrounding it while passing through the Fallopian tube. Others will tell us that while the ovum is passing through the latter it gets its supply of nutriment from a special secretion of the Fallopian tube itself. The ovum, on reaching the uterus, obtains its nourishment, at first, chiefly from the umbilical vesicle, either directly or indirectly, through omphalo-mesenteric vessels. The facts of the latter forming a connection between the umbilical vesicle and rudimentary intestinal canal of the ovum, and of the gradual disappearance of the contents of the vesicle in proportion to the growth of the ovum, seem to establish this position.

When the allantois is formed, a vascular communication is established between the embryo and the chorion, and the rootlike villi of the latter imbed themselves into the decidua in such a manner as to bring their contained bloodvessels in close relation to the vascular system of the mother, so as to render the endosmosis of nutritive material from maternal sources an easy matter.

When the placenta is formed, the connection between the fœtal and maternal vascular systems becomes more centralized and intimate, but, of course, never direct, as the reader has already been informed, for there is a thin septum between the fœtal and maternal portion of the placenta, destitute of bloodvessels and lymphatics of any kind whatever. Yet this partition permits absorption or endosmosis, and hence the passage, in this way, of nutriment material from the blood of the mother to that of the embryo.

Professor Goodsir, and others, believe that although a part of this process is carried on by endosmosis, yet some of it is, in reality, attributable to a process of intermediate cell-growth, by which nutritive matter is elaborated expressly for the embryo. He thinks that there are two distinct sets of nucleated cells lying between the maternal and fœtal blood, one of which lies external to and in contact with the terminal vessels of the womb, and possesses the

power of separating from the maternal blood the necessary pabulum for the embryo. The other layer of nucleated cells lies between the wall of the vascular loop of each fœtal villus and the membrane of the latter, and has for its object the reception of the nutritive material specially elaborated on the maternal side of the placenta. There is said to be a little space between the two layers where the secretions from either layer are temporarily held until absorbed by the other. By this means it is thought that the fœtus not only derives a portion of its nourishment from the mother, but is enabled to dispose of a part, if not all, of its excrementitious materials.

Many physiologists maintain that a certain amount of nourishment is received by the embryo or fœtus from the liquor amnii by cutaneous absorption, or by being conveyed into its intestinal canal by deglutition or spasmodic efforts at respiration; and that the liquor amnii obtains its supply from the circulation of the mother. Even if this were true the quantity thus obtained would necessarily be very limited, as the liquor amnii contains only a very minute quantity of nutritive material,—not over 9 parts of albumen in 1000.

Discarding the very questionable observations of Burdach, who found the lymphatics of the intestines of a fœtus recently removed from the cavity of the amnion empty, while its cutaneous lymphatics were engorged; and placing but little reliance on Weydlich's experiment of keeping a newly-born calf alive for fifteen days on amniotic fluid alone, and giving only moderate credit to the assertions of others that substances introduced into the stomach and blood of the mother have subsequently been found in the liquor amnii, the placenta, and the fœtus, we can have no very firm faith in the hypothesis of fœtal nutrition from the liquor amnii. Whether or not we are to look upon the latter as affording any nourishment, it is very plain that the chief supply of nutritive material for the fœtus is derived from the maternal blood through the placenta. That there is, however, no direct communication between the maternal and fœtal circulations is certain, as may be proved by the fact that the pulsations of the fœtal heart are nearly twice as frequent as those of the mother; and by the fact that it is impossible to cause the finest injecting material to pass from the maternal to the fœtal side of the placenta, or *vice versa*. But, although the maternal and fœtal sides of the placenta

are separate and distinct, the precise nature of the anatomical structure or septum that divides them cannot be fully demonstrated by anatomists. According to the theory of those who believe that the chorionic villi of the placenta dip into sinuses of the mother's blood on the maternal side of the placenta, either directly or through the investment of a thin membrane, the septum must be the walls of the villi themselves and their contained capillary loops, with or without the investing membrane. The septum must also be substantially the same as that recognized by the hypothesis of those physiologists who deny the sinus construction of the placenta, but affirm that the villi absolutely penetrate, or, at least, lie side by side and in connection with the maternal uterine bloodvessels.

The Circulation of the Fœtus.—The circulation is that function by which the blood or nutritive fluid is distributed to all parts of the body. In its extended meaning it of course belongs equally to plants and animals. The obstetrician, however, must treat of it mainly in its relations to the human fœtus, and in order to do so understandingly I shall at first describe the circulation of the adult, and thus contrast this with the peculiarities of the circulation of the fœtus.

In the adult, or in the child after birth, the venous blood is received into the right auricle of the heart; it then passes through the tricuspid orifice into the right ventricle, and thence continues its course along the pulmonary artery and its branches to the lungs to be aerated, after which it is taken up by the pulmonary veins to be conveyed to the left auricle, from which it is sent into the left ventricle, and thence throughout the entire system by the channel of the aorta and its numerous subdivisions, to be collected by the minute branches of the venous system and conveyed successively from the smaller to the larger branches until it reaches the great trunk veins, and is thrown into the right auricle where we first found it. By the great trunk veins I mean the descending and ascending vena cava; the former collecting the blood from the head and upper extremities, and the latter from the inferior parts of the trunk and lower extremities.

The *born* and *unborn* child have each a great central organ, the heart; each has two orders of vessels, the arteries and veins; but the two auricles of the fœtal heart have a direct communication through the foramen ovale, which is not the case in the adult.

There are other anatomical peculiarities in the construction of the circulatory apparatus of the fœtus, such as the *ductus arteriosus*, the *ductus venosus*, the *umbilical arteries*, and the *umbilical vein*, which may be described along with the description of the course of the fœtal circulation.

As the fœtal lungs are in abeyance their function has to be performed by an organ outside of the fœtus itself,—the placenta. The

FIG. 42.

blood which returns from the latter, after having been aerated, and replenished with nutritive material, is no longer *venous*, but really *arterial*, blood; yet in contrast with the usual order of things, appertaining to the circulation of the adult, it is conducted to the fœtus through a vein, the umbilical (Fig. 42, *d*), which, passing into the fœtal abdomen at the umbilicus, sends off a branch to the liver, conducting pure placental blood, and that returned from the intestines by the vena portæ (*g*), all of which is afterwards collected by the hepatic vein and conveyed to the ascending vena cava at *h*.

The moment the umbilical vein sends off the branch to the liver it assumes another name, that of *ductus venosus* (*a*), which enters the vena cava ascendens at a point a little lower than the hepatic vein. The main portion of the blood from the placenta is thus conducted first along the *umbilical vein*, and then along the *ductus venosus* into the ascending vena cava, where it is mixed with the blood brought from the liver by the hepatic vein, and that returned from the lower extremities. This mixed blood is conveyed into the right auricle, and the greater part of it is directed by the Eustachian valve through the foramen ovale into the left auricle. Thence it passes into the left ventricle, which sends much the greater portion of it through the three great vessels of the aortic arch into the head and upper extremities; a small quantity, however, being sent to the inferior extremities. The blood thus transmitted to the head and superior extremities is collected by the branches of the vena cava superior, and carried by the latter into the right auricle. Thence the main portion passes into the right ventricle, and afterwards into the pulmonary artery, and from this by the channel of the *ductus arteriosus* (*r*) into the descending aorta; and thence the greater portion is conducted by the umbilical arteries to the placenta for purification, while a comparatively small quantity passes on into the lower extremities.

Although allusion has just been made to the blood from the right ventricle passing into the pulmonary artery, and thence through the *ductus arteriosus* to the descending aorta, the reader must not think that it also passes through the lungs. On the contrary, I desire that he should understand that only a very small portion is conveyed to these organs during fœtal life, in fact barely sufficient for their nourishment and the keeping of their vessels in good order for service when the child is born; because their function for aerating this fluid is until then in abeyance. It is the special office, however, of the *ductus arteriosus*, which may be considered a continuation of the pulmonary artery in the fœtus, to conduct all the blood sent from the right ventricle into the pulmonary artery, except the little allowed the lungs for nourishment and the keeping open of their vessels, into the descending aorta, to be distributed as before stated.

The student may thus see that there are five special conductors or anatomical structures for the fœtal circulation, two of which, the *ductus arteriosus* and *foramen ovale*, assist in diverting the blood

from the lungs, while the third, or *ductus venosus*, forms a connection between the vena cava and the umbilical vein, or fourth conductor. The umbilical arteries form the fifth structure. The lungs spring into functional activity as soon as the child is born, and their sudden action, conjoined with the arrest of circulation of the placenta, consequent upon the severance of the umbilical cord by the accoucheur, causes an immediate change from the fœtal to the adult form of general circulation. There being no further use for those special anatomical structures to which attention has already been called, they gradually become obliterated and finally disappear, with the exception of those parts of the umbilical arteries which become merged into the internal iliac and superior vesical arteries. The time of their complete obliteration varies according to circumstances, but rarely extends beyond the fifteenth day after birth. They are practically impermeable much earlier than this date. The circulation ceases completely in the umbilical arteries about the second day, in the umbilical vein and ductus venosus about the seventh day, and through the foramen ovale and ductus arteriosus about the tenth day, but may continue as above stated a little longer. Yet it must be borne in mind that there is very little blood conveyed through any of these channels from the time that the lungs begin to act. Although the foramen ovale is one of the latest of these special structures to become obliterated, it is fortunately generally the first to contract so as to cut off the circulation through it. Where it fails in this respect, as is sometimes the case, more or less blood never reaches the lungs to be aerated; and just in proportion to this failure is the life of the child jeopardized by what is called *morbus cærulus*, *cyanosis*, or blue disease; so designated from the dark purple, or bluish tint assumed by the child, or person, when the circulation is thus defective. An imperfect closure of the foramen ovale is not, however, invariably followed by this result, as it has been shown by Dr. J. W. Ogle and other observers that it really does remain more or less open in many persons without serious inconvenience.

In the embryo, up to about the third month, there is no partition between the auricles; there being, in fact only a single auricular cavity. The dividing partition which ultimately separates the two auricles commences to form at that period.

The difference in color of arterial and venous blood in the mature fœtus is not so marked as after birth, owing to the manner in

which the arterial and venous currents commingle, and to the comparatively imperfect manner in which this fluid is aerated in the placenta.

How is the Blood Aerated in the Placenta?—This question presupposes that the blood is oxygenated in the placenta, which is, as already stated, both lung and stomach for the fœtus. That the placenta is the site of aeration, and that this vitalizing process is essential to the life of the fœtus, are proved by the facts that long-continued compression or severance of the umbilical cord gives rise to instinctive attempts at inspiration, and that if the fœtus is so situated as not to get external air, death from asphyxia is the sure result.

Although there are many ingenious hypotheses upon the subject, the exact mode in which the blood of the fœtus is oxygenated before the formation of the placenta is not yet determined. It is, however, generally believed that the oxygen for this purpose is supplied in some indirect manner from the circulation of the mother. And, in fact, this is the case during the whole of intra-uterine life. But it is less difficult to comprehend how it is effected after the formation of the placenta than prior to that period. Of course all the old theories, based upon a direct or continuous circulation between the maternal and fœtal sides of the placenta, are exploded, because founded upon false premises. Yet we know that the blood of both mother and child are brought into such close proximity by the placenta that an interchange of gases seems to be an easy occurrence—the fœtal blood giving up carbonic acid and absorbing oxygen. It must be remembered that until the child is born and the active movements of respiration commence, there is but very little carbon thrown off, or of oxygen needed, in comparison to what occurs in this respect after the birth of the child. This is owing in part to the fact that the waste of tissue in the fœtus is very slight, and this in its turn is due to the absence of respiratory movements and the function of digestion, together with the suspension of the fœtus in a liquid of its own temperature.

The function of oxygenation involves an interchange of gases as already stated, but whether the oxygen passes one way and the carbonic acid the other, in accordance with the laws regulating the interpenetration of fluids, or whether they pass through an intermediate vehicle, the source of the supply is undoubtedly the

same. The respiration of fishes bears a striking analogy to that of the fœtus. In both there is simply an interposition of a membranous structure between the fluid containing the oxygen and the blood to be decarbonized by its absorption.

Hepatic Function.—The liver is proportionately very large in the fœtus. It might be inferred from this fact alone that it is functionally very active. Previous to the fifth month the texture of the fœtal liver is soft and without any characteristic features. But during the fifth month the liver is sufficiently developed to secrete bile. Claude Bernard asserts that one of its chief functions after this period is the formation of sugar, which is comparatively more abundant in the fœtus than in the child after birth. But, although the liver after its development may be the main fabricator of sugar, yet as the latter is found in the mucous and cutaneous tissues prior to this event, it is highly probable that they, as well as the placenta, possess the power of elaborating it.

From about the sixth month of pregnancy the bile begins to collect both in the gall-bladder and in the intestines. In the latter it is mixed with mucus, forming the *meconium*, a semifluid, greenish, tenacious substance found in the intestinal canal of the fœtus, especially the colon and rectum, in large quantity after birth. It is often evacuated during labor, particularly in pelvic presentations, and thus forms assistance in a differential diagnosis between a breech and head presentation.

Many physiologists are of the opinion that it is through the liver rather than through the placenta that the most carbon and other effete materials are removed from the fœtal system. But the majority believe that this is accomplished chiefly by the placenta.

Urinary Function.—No stronger proof is needed of the formation of urine during fœtal life than the fact of the bladder being frequently emptied of large quantities immediately after the birth of the child.

Owing to traces of urea being found in the amniotic fluid, and to the circumstance of the bladder being enormously distended in some cases of imperforate urethra, it has been believed by Cazeaux and many others that the fœtus voided its urine through the urethra into the amniotic cavity. But Joulin, who has found many cases of imperforate urethra without any distension of the bladder, and who believes that the quantity of urea in the liquor

amnii is too small to coroborate the theory that the urine of the fœtus is regularly received into it, comes to the conclusion that there is no abundant and regular secretion of urine during intrauterine life, and that its retention at that period is not prejudicial to the health of the fœtus. He allows, however, the probability of a small quantity being passed into the liquor amnii from time to time by the fœtus.

Nervous Function.—Although it is universally admitted that there is more or less nervous activity in the fœtus, authors are divided in opinion as to its nature. Some believing it to be entirely of an automatic or reflex character, such as may be aroused by the sudden application of cold, or pressure, or stimuli to the abdomen of the mother. They assert that the encephalic functions are dormant during the whole period of intrauterine life of the child. Others, however, assert that although the actions of the fœtus may be chiefly of an automatic or reflex character, yet there is, during the latter months at least of gestation, a capability of spontaneous motions being produced by instinct, or a vague exercise of volition. In proof of which they refer to the well-known experiment of laying open the abdomen of a rabbit, and pinching with a pair of forceps the fœtus through the thin and transparent walls of the uterus. But those who advocate the opposite theory assert that this experiment and the one of laying open the fœtal membranes and applying irritation direct to the skin of the fœtus, and thereby producing movements, prove nothing more than automatic or reflex motion.

CHAPTER VIII.

PREGNANCY.

PREGNANCY may be defined to be that state of the female who has within her a fecundated germ, which under normal and favorable conditions gradually develops into a mature fœtus, and is expelled from the maternal organs, or, in more simple language, it means the condition of a woman who is with child.

HOW IS PREGNANCY DIVIDED?—There are many divisions, subdivisions, and varieties of this subject, the names and definitions of the chief of which it is better for the student to learn before going further. Pregnancy may be *true, false, uterine, extra-uterine* and *interstitial*. It is *true*, when there is an *embryo* or *fœtus; false*, when the symptoms are simulated by something else than an embryo or fœtus; *uterine*, when the product of conception is contained within the cavity of the womb; *extra-uterine*, when it is external to the uterus; and *interstitial*, when it is lodged in the tissues composing the uterine walls, not merely beneath its internal or external coat, but in the meshes of the intervening tissues.

There are three varieties of *extra-uterine pregnancy*,—the *ovarian*, *tubal* or *Fallopian*, and *abdominal*. In the first variety the fœtus becomes developed in one of the ovaries; in the second variety it never reaches the uterus but grows in the Fallopian tube; and the third variety is where the fecundated ovum fails to reach the Fallopian tube for the purpose of being conducted into the uterus, but actually falls into the peritoneal cavity of the abdomen, and there becomes more or less developed. An abdominal pregnancy may also be consecutive to a Fallopian one, the tube-cyst bursting early, without causing the death of either mother or embryo; and the latter developing, first in the pelvic cavity, and, as it enlarges, rising into the abdomen. Such a fœtus may be encysted or free, and may grow to full maturity. It is also customary to divide pregnancy into three other varieties,—*simple, compound*, and *complicated*. In simple pregnancy there is but one embryo or fœtus; in compound pregnancy there is more than one; and in complicated pregnancy there is in addition to a fœtus some abnormal growth, such as a fibroid tumor, polypus, or an enlargement of one or both ovaries.

Changes in Form and Magnitude of the Gravid Uterus.—The changes that take place in the uterus after conception has occurred, are truly marvellous, and have no analogy in animal growth or development. The old theory was, that the pregnant uterus was simply distended by the enlargement and pressure of its contents, like an india-rubber toy balloon by gas or air. We now know that it becomes increased in size by both hypertrophy and hyperplasia; that its tissues, especially the muscular fibres, absolutely grow in length and breadth, and that additional tissues of like character are produced. This change may be appreciated when we consider that the unimpregnated womb weighs about an ounce, and is on an average 2½ inches long, while the pregnant uterus at full term weighs about twenty-four ounces, and is on an average one foot in length. The womb begins to enlarge from the moment the fecundated ovum reaches its cavity, if not from the time of conception, and continues to grow until the delivery of the child.

As during the first three months of pregnancy the womb remains in the inferior or true pelvis, its shape and size can only be ascertained by careful conjoined manipulation in a relaxed condition of the abdominal muscles. Its growth at this period is chiefly in a lateral direction, giving it more of a spherical form than it possessed prior to pregnancy, but being slightly flattened on its posterior surface.

During the fourth month the pregnant uterus rises above the brim of the pelvis into the abdomen, and subsequently enlarges, mostly in a vertical direction, and becomes more and more of an ovoid form. To repeat then, we find the womb when unimpregnated of a pyriform shape, during the first three months of pregnancy of a spherical form flattened posteriorly, and during the latter period of gestation of an ovoidal form, with its narrow extremity pointing downwards toward the os uteri, and its larger end placed upwards, provided there is a breech or head presentation, with its longitudinal axis corresponding with the abdomen of the mother.

Changes in Structure.—The texture of the uterine tissues is greatly modified during pregnancy by hypertrophy. In fact the wonderful increase in dimensions of the uterine walls is mainly owing to these radical changes in structure. The most remarkable modifications occur in its muscular tissue, the rudimentary

fibres of which increase from two to seven fold in width, and from seven to eleven times their original length. New unstriped fibres are also largely developed, particularly in the internal muscular layer. These new fibres are generated during the first five or six months of pregnancy. The tissue connecting the muscular fibres is also largely increased. As regards the special arrangement of these fibres there is much discrepancy of opinion. In a general sense it may be considered that they are irregularly disposed in two principal layers or groups,—an external or longitudinal (Fig. 43), and an internal, or circular group (Fig. 44), somewhat analogous to their arrangement in the other hollow viscera. Yet but a small proportion of the external fibres assume the true longitudinal direction. In most of the drawings we shall find

FIG. 43.

FIG. 44.

them described as taking various directions. The same remark applies, but with less force, to the internal layer. The drawings represent the most of the fibres of the latter as taking a transverse direction, especially in the lower half of the womb. It is only in the impregnated uterus that the fibrous layers can be distinctly marked out. As it regards the peritoneal covering the celebrated William Hunter believed that its extension in proportion to the enlargement of the uterus was due to the unfolding of the layers of the broad ligament, and not to the increase in growth of its component tissues. We now know that its extension is partly due to the latter cause, although the layers of the broad ligament do also unfold. The lymphatics and bloodvessels increase in size, and probably the nerves also. But whether the nerves become simply hypertrophied, or take on in addition new

tissue, it is not fully settled. In short all the tissues of the uterus become changed, even its mucous membrane, which was alluded to in the last chapter. These changes are intended to prepare the uterus for the accommodation of the growing embryo, and to provide ways or means essential to its nourishment.

CHANGES IN SITUATION AND ANATOMICAL RELATIONS.—The changes that the womb undergoes in form and dimensions in the different stages of pregnancy must, of course, produce corresponding alterations in its situation and anatomical relations. As the fundus of the unimpregnated uterus lies just beneath the plane of the pelvic brim, and as the impregnated womb does not rise above the brim during the first three months, we naturally come to the conclusion that its augmented size during this period must find room in downward and lateral directions. We find from observation that such is the case. This organ at this period gradually presses more and more downwards, or into the inferior portion of the pelvic cavity; so that a careless examination, especially by the inexperienced practitioner, would lead him to suppose that his patient was laboring under prolapsus uteri. Again and again I have seen this mistake in diagnosis. If there happens to be a forward or backward displacement of the womb about the middle of the fourth month of pregnancy, there is frequently great difficulty, and, of course, pain in the efforts of the enlarged womb to rise above the brim of the pelvis, and assistance sometimes becomes necessary. For the management of such case, see retroversion of the womb, Chapter XV.

Instead of there always being an increase in the size of the abdomen prior to the rising of the impregnated uterus above the brim of the pelvis, as is supposed by some, there is generally a slight decrease, or, at least, the abdomen becomes a little flatter than usual. This is owing to the sinking down of the womb, because of its augmented weight, into the inferior part of the cavity of the pelvis during the first three months of pregnancy. The increase in the abdomen, when occurring during the first three months of pregnancy, seems to be owing to hyperæmia of its bloodvessels and an accumulation of gas in the intestinal canal.

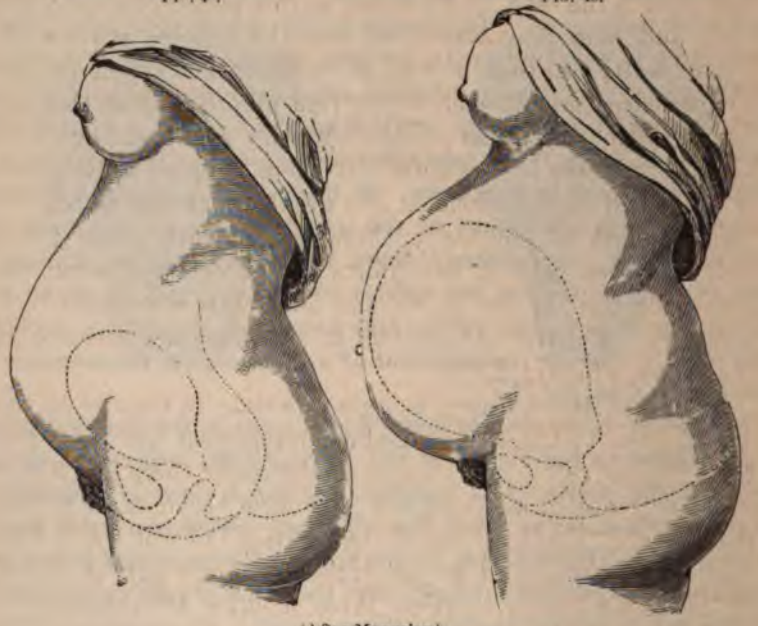
When it becomes too large for the pelvic cavity, its fundus gradually rises above the brim. The os and cervix, instead of being nearer the floor of the pelvis than they were before pregnancy,

as is the case previous to the elevation of the womb, are now often raised above the normal level.

By firm pressure of the fingers just above the symphysis pubis, the fundus uteri may at this time be felt as a smooth, rounded swelling. The movements of the fœtus are generally felt by the mother for the first time about this period. She is then said "to have felt life or to have quickened." At the expiration of the fourth month the womb may be found about three inches above the symphysis pubis.

Towards the end of the fifth month it occupies the whole hypogastric region, and produces a perceptible projection to that part of the abdomen. It may be felt a little above the umbilicus at the termination of the sixth month (Fig. 45); and from two to

FIG. 45. FIG. 46.



(After Maygrier.)

three inches above this point at the end of the seventh month. The umbilicus at this time, instead of being depressed, as in the non-pregnant condition of the uterus, begins to project outwards. The womb continues to increase until it fills the cavity of the abdomen, or until its fundus reaches very nearly the level of the ensiform cartilage, which occurs about the middle of the ninth month (Fig 46). During the remaining two weeks of pregnancy

it frequently sinks or settles down a little, sometimes to the great relief of the woman in respect to being able to breathe more freely. These facts are useful for us to bear in mind even when the signs of pregnancy, to be spoken of presently, are available; but sometimes they are our main reliance in forming a conclusion as to the period of parturition, especially when the female has become pregnant during lactation. There are also other less prominent changes in the anatomical relations of the uterus during pregnancy that may conveniently be described before going any further, especially the direction of the longitudinal axis of the uterus. So long as the gravid uterus remains in the lower or true pelvis, its direction varies but little from that of the non-pregnant organ, being sometimes more or less vertical; at other times either in a state of anteversion or partial retroversion, depending somewhat on the degree of relaxation of its various ligamentous supports, upon the pressure of the intestines and abdominal organs, but chiefly upon the relative distension or emptiness of the rectum or bladder. In a few cases there may be decided anteversion, retroversion, or even retroflexion; but where the history of the case can be ascertained, it generally turns out under these circumstances that the displacement existed prior to pregnancy having taken place. After rising above the brim of the pelvis the uterus naturally in its long diameter tends to the direction of the axis of the brim, so as to form, when the woman is erect, an angle of about thirty degrees with the horizon; but when she is in a semi-recumbent position, it is nearly vertical. At the full period of gestation the uterus occupies the greater portion of the cavity of the abdomen, and lies in immediate contact with the anterior wall of the latter. Where the abdominal walls become greatly relaxed, which is sometimes the case in multiparæ, the womb is displaced entirely, and occasionally to such an extent as to allow the fundus to hang forwards and backwards below the level of the symphysis pubis.

Lateral Inclination.—There is generally a lateral, as well as forward, inclination of the gravid uterus, after it rises into the abdomen. This obliquity is occasionally very decided, the womb being entirely on one or the other side of the spinal column, generally the right. Among its many supposed causes the two most prominent are a distended rectum and the normal anterior projection of the spinal column. Although the first may not have much effect subsequent to the rise of the uterus into the abdo-

men, yet by giving it an inclination to the right side prior to this event it is very easy to understand why it should continue in that direction upwards, on account of the prominence of the spinal column having a tendency to retain it on whichever side it happens to be inclined.

In consequence of the anterior obliquity of the womb, to which allusion has already been made, and of its thus lying in immediate contact with the anterior abdominal parietes above the line of the bladder, we must, of course, expect to find the intestines and other structures behind, and on its sides; except in rare instances, when a portion of the former may intervene between this organ and the walls of the abdomen.

To sum up, then, as the lawyer would say, we find during the latter months of pregnancy, the uterus with its appendages close to its sides, in relation in front with the posterior part of the bladder and the abdominal parietes. Its relation behind, counting from below upwards, is the rectum, the promontory of the sacrum, the mesentery, and a portion of the intestines. On its left side is the sigmoid flexure of the colon, and nearly all the small intestines. On its right is the cæcum and right abdominal wall, with a part of the small intestines; and the colon forms an arch over and around the uterus.

The Signs and Symptoms of Pregnancy.—The various changes in form, magnitude, structure, and situation of the uterus already spoken of, might have been included under this head, but it has been thought best to give them a special consideration.

It is the prevalent public opinion that there is no difficulty in a physician's determining the presence or absence of pregnancy. As a rule this is correct so far as experienced practitioners are concerned, but even they are sometimes mistaken, no matter how many years of intelligent and active observation they may bring to bear on the solution of this most delicate, complex, and responsible problem. It is often impossible in the early stages of pregnancy to arrive at a positive conclusion in regard to the nature of the case, but after the third or fourth month there is rarely any difficulty in satisfying ourselves fully upon the subject. The accoucheur's professional reputation, and the moral character and happiness of thousands, will depend upon the care and ability exercised by him in forming conclusions in these cases. Many a man has been falsely accused, and has had his character blasted for life,

by designing women for mercenary purposes, when the whole question turned upon the simple point of pregnancy or no pregnancy as to the female accuser, and has been too hastily decided in the affirmative by the medical expert whose professional opinion has been sought. On the other hand, numerous have been the cases in which charming and Christian women have gone to their graves with broken hearts, as the sad result of venomous slander, when more intelligent and carefully formed opinions by medical men upon the subject of pregnancy would have restored to them friendship, esteem, and love, and enabled them to live long and happy lives.

My advice to the student then is to study this subject thoroughly, and when called upon for an opinion to be exceedingly cautious in coming to a conclusion, and not to decide positively, except upon the most certain chain of evidence, especially in cases of unmarried ladies, or others where hope, health, a large estate, character, or life is involved. Unfortunately it is precisely in those instances where the opinion of the physician will be most sought that difficulties will be encountered in coming to a conclusion, because he will not be able to place much reliance on the statements of his patient, whose interest it may be to deceive him. But where no deception is intended, the woman, who strongly desires either an affirmative or negative opinion, often colors her statements so as to mislead both herself and her too-confiding and careless adviser. I hope that the reader will not consider these hints upon so important a subject as taking up too much of his time, and with his permission I shall proceed to the consideration of some of the evidences of pregnancy. Without adopting any particular classification of the signs and symptoms, I shall speak of them somewhat in the order of their appearance.

Cessation of Menstruation.—One of the first presumptive symptoms of pregnancy is a cessation, or suppression, of the catamenia. When this occurs in a woman who has undergone the risks of impregnation it becomes a very important and significant, but by no means infallible, sign. The menses cease to flow from various causes besides pregnancy, and sometimes continue to flow when the woman is in the latter interesting condition. It cannot therefore be solely or even mainly relied upon as a symptom of preg-

nt is a very important and constant one. It has also a

mportance beside the one bearing on the question of

whether a woman is pregnant, because it is the most reliable help in calculating the period of parturition. Its non-appearance in a woman who knows herself to have been exposed to the cause of impregnation, who has previously been perfectly regular, in whom there is no other probable cause of its suppression,—such as exposure to cold, sudden emotion, incipient phthisis, general debility, change of life, or other causes more or less morbid in their influence,—is strong presumptive evidence of pregnancy. But this must be strengthened and verified by other symptoms before we can come to any positive conclusion upon the subject.

Suppression from Cold.—The medical man knows that cessation of menstruation in and of itself cannot be taken as positive proof of pregnancy, because there are so many other causes that may produce this result. Exposure to the influence of cold is perhaps one of the most common of these. This is so well understood that it has become a common practice for a woman when she desires abortion produced, and knows that a respectable physician, if made aware of her true condition, will not aid in her design, to feign having caught cold just before or at the commencement of her monthly flow. For fear that I may forget to call attention to the subject when we come to the consideration of abortion, I shall now caution the young physician to always be on his guard when such an application is made to him; and never, in doubtful cases, prescribe anything that might cause an abortion. Criminal abortion is prohibited by the laws of God and of man; and the person who practises it, as, alas! too many do, is almost certain to be called to an account for his crime in the course of time, and will surely be in eternity. Whether his services are sought in this indirect way or in a more candid manner, the doctor must never yield to his patient's entreaties. Neither ought he to give her a mere placebo, as I have known physicians to do; for besides creating false hopes, he runs the risk of a criminal prosecution should his patient abort in the meantime from unappreciable causes, and especially if she should die.

Mental Impressions.—Of the causes incidentally alluded to as likely to produce a temporary stoppage of the courses, we find strong mental impressions to stand somewhat prominent. An unusually strong desire on the part of a newly married woman to be pregnant is thought by some to have the effect occasionally of temporarily suspending the menses. It is also believed by many

medical men that the same effect is often produced in unmarried women by alarm and mental emotion after having exposed themselves to the risk of impregnation.

As the suppression under either of these circumstances is apt to be followed by an enlargement of the abdomen and an increased sensibility of the mammary glands, the patient, and sometimes the careless physician, may easily be deceived.

However, it is highly probable that instead of the mental impression causing the temporary cessation of the menstrual discharge in these cases, it is partly, if not wholly, due to the irritation or derangement produced in the genital organs by sexual intercourse, as these parts are often not only much irritated, but even inflamed, by the first conjugal approaches.

Can a Woman Menstruate During Pregnancy?—I can, from personal observation, answer this question in the affirmative; but menstruation at this time is extremely rare, and is commonly limited to the first month or two after conception; yet it may continue during the whole period of gestation.

The explanation of how menstruation may take place in the early part of pregnancy is easily comprehended. The menses, as the reader is aware, are mainly excreted by the mucous membrane lining the cavity of the uterus. The decidua vera and decidua reflexa are only modifications of this membrane, and as they have a considerable space between them in the early months of gestation, it is easy for the catamenia to flow from the free surface of the former, and find its exit externally. It is not so readily understood how menstruation may occur after the blending together of the decidua vera and reflexa, which occurs at the end of the third month of pregnancy. When the flow really takes place it must come from the canal of the neck of the womb.

The majority of the supposed cases of menstruation during the latter months of pregnancy may be accounted for by the presence of a small polypus, placenta prævia, an abraded cervix uteri, a tendency to miscarriage, or of some other source of hemorrhage entirely disconnected with menstruation.

Can Pregnancy Occur When Menstruation is Absent?—This question must be answered affirmatively. There are a few instances of the kind before the first, and after the last, appearance of the menses; and there are many examples during the suppression of this discharge on account of lactation. The diagnosis of pregnancy

under these circumstances is often difficult, especially in the first few months.

When conception takes place during lactation the secretion of milk, as a rule, gradually or suddenly becomes suppressed. But this is not always so, for some women are able to nurse their infants during the entire period of gestation. As there are so many exceptions to the rule that pregnancy only occurs in females who are capable of normal menstruation, we cannot look upon the suppression of this periodical discharge as amounting to more than mere presumptive evidence of pregnancy. It is, however, of great consequence in the general chain of testimony bearing upon this most important subject.

Gastric Disturbances.—Irritability of the stomach is one of the most constant and one of the most important sympathetic symptoms connected with pregnancy. As it is usually felt in the morning, on first rising from the recumbent position, it is almost universally known among women as the "morning sickness." There are all shades and degrees of it, from the mildest nausea to the most extreme efforts at retching and vomiting. It may recur at intervals for a few days, a few weeks, or months, or last during the entire period of gestation. I have seen some cases where much doubt arose as to whether or not premature expulsion of the ovum or fœtus should be produced in order to save the women's lives, as the vomiting was so constant and severe that it seemed as though it was impossible for the patients to retain in their systems sufficient nutriment for sustenance. But I have never yet resorted to this extreme measure. It is, however, sometimes necessary as a *dernier ressort*. "Morning sickness" is so suggestive of "sea-sickness," that I frequently inquire of a married lady who has had children and is pregnant again, whether she is on another voyage, instead of putting the direct question; and I universally get a proper response.

When a woman, between the ages of fifteen and forty-five, tells us that her monthlies have stopped, and that she is sick at the stomach every morning, we have strong grounds for suspicion that she may be pregnant; but, as both of these symptoms may occur from other causes, especially from suppression of the courses by exposure to cold, we cannot form a positive opinion, and should seek for additional evidence. If we were to pronounce her pregnant the result would, in all probability, sustain our diagnosis. It

is far preferable, in these delicate and responsible cases, never to hazard an opinion solely upon such proof. In some women nausea manifests itself immediately after fecundation; in others, not until the fifth month of gestation; but in the vast majority it shows itself about the end of the first and disappears before the expiration of the fourth month.

As a rule, it is not accompanied by actual vomiting; the woman simply feels sick and unable to eat her breakfast, and brings up, now and then, a little glairy fluid. Nevertheless, vomiting often occurs, and, sometimes, as previously stated, in the most distressing form. There are many diverse opinions in regard to the cause of morning sickness. The most generally acceptable explanation attributes it to the stretching of the tissues of the womb by the constantly enlarging ovum, thus producing nervous irritation. All the sympathetic phenomena of gestation are susceptible of the same solution.

Depraved Appetite.—Intimately associated with the symptoms of morning sickness are other sympathetic phenomena, such as eructation, pyrosis, gastralgia, etc. The appetite frequently becomes depraved, the woman longing for unusual articles of diet, and having a repugnance for many things of which she was previously passionately fond. She is generally apt to take a fancy for pickles, especially for those kinds most difficult to be obtained. These fancies are so well understood by women as to afford an inexhaustible source of merriment when they happen to drop in on a newly married friend unexpectedly, and find her at the sideboard regaling herself on a jar of pickled *cucumbers* or *olives*.

I have several times known pregnant females to eat so many pickles as to make themselves ill. In one instance I saw gastritis follow, and finally death. This unfortunate lady ate about three pints of pickled cucumbers in a single day. Occasionally the appetite becomes so depraved that a longing for highly deleterious or disgusting articles is manifested. Chalk and slate-pencils are among the least harmful of these dainties.

It generally follows that a woman who suffers from these sympathetic disturbances in one pregnancy will be troubled by them in succeeding ones, somewhat in the same form; but there are numerous exceptions, as we frequently hear of one who has had these symptoms in a marked form at her first pregnancy and none on subsequent occasions of a like nature. Occasionally we meet with

cases of freedom from these phenomena until the fifth, sixth, or seventh pregnancy.

SALIVATION.—In these days, when it is considered almost a criminal offence to salivate a patient, it may be well for the physician to know that pregnancy occasionally produces an excessive secretion of saliva. Thirty years ago it was so fashionable in the treatment of many diseases to "touch the gums," as a very moderate degree of salivation was termed, and even to produce full ptyalism, that no harm was attributed to this result, let it occur when it might. But at present he must be able to defend himself against a false charge, when the administration by him of some simple purgative to a pregnant woman should happen, as a mere coincidence, to be followed by salivation.

In such an emergency it is important that he should be able not only to deny having given any preparation of mercury or other sialogogue, but to convince the woman and her friends that the salivation was really due to pregnancy.

It is a lamentable fact, however, that in many instances where patients are disposed to blame their physicians wrongfully, no amount of reasoning will ever convince them of their error, or, if convinced, they will rarely acknowledge the fact, as it is so much more congenial to persons of a certain stamp to slander their faithful physician than to pay him for many *weary days* and *sleepless nights* of attendance.

I do not desire to be understood as inculcating the idea that this is the usual manner in which physicians are rewarded for their toil and skill. God forbid! All experience teaches the reverse. The manifestation of sincere confidence and thankfulness by patients towards their family physician, often gives him more real satisfaction than the prompt liquidation of their indebtedness.

CHAPTER IX.

In the last chapter we discussed at some length several interesting symptoms of pregnancy, and with the permission of the reader we propose to continue this very important subject.

Despondency.—It occasionally happens that pregnancy changes the temper and disposition for the better, and renders the expectant mother happy at the prospect of binding the conjugal relations more firmly by a new pledge of affection. This is not always the rule. The vulgar injunction to a fussy, irritable man not to get in the "family way" is expressive of the common belief that pregnancy does not sweeten the disposition of a woman. And such is the fact, particularly during the first and last months of pregnancy. But the most disagreeable mental aberration is *despondency*, which is occasionally so great as to deprive the unhappy woman for the time being of all hope of recovery from the dangers of childbirth. I have known ladies in this state of depression of spirits to be unwilling to make the slightest preparation for the period of confinement in the way of wardrobes for their children or themselves. But, although great despondency is far from uncommon, it is not present in the majority of cases. Yet very few women escape entirely from moods of more or less depression during the period of gestation. These mental peculiarities are, however, of no certain diagnostic value, and are of use only when taken in connection with more important phenomena.

Changes in the Breasts.—The changes that occur in the breasts after conception has taken place are of great importance in a diagnostic point of view. The period of their appearance is variable, but, as a general rule, about a month after fecundation the breasts become more or less congested, and commence to increase in size, accompanied by sensations of fulness and weight, and a vague sense of stinging or pricking. They also assume more mobility and firmness. Darting pains shoot through them and the nipples in many instances.

When the enlargement becomes considerable, there may be noticed coursing beneath the skin, especially in females of a fair

complexion, a few large blue veins. It is frequently possible at a somewhat advanced stage to feel clusters of enlarged milk-ducts, and when the extension is very great silvery white lines can be seen radiating from the nipples over the mammary surface. These have their origin in the distension of the skin and adjacent structures, and a giving way of the corium at certain places.

CHANGES IN THE NIPPLES AND AREOLA.—As symptoms of pregnancy, the most important changes are those connected with the appearances of the *nipples* and the *areolæ*, and the presence of *milk* in the mammæ after a few months. The nipples are often

FIG. 47.

Appearance of the Areola in Pregnancy.

coated with minute branny scales as the result of the desiccation of the fluid oozing from them. This fluid in the early months of pregnancy is little more than serum, but it gradually assumes a lactescent character. The nipples become increased in size and turgid. Simultaneously with, or closely succeeding these changes in the nipples, are changes in the *areolæ*. The latter are the circles surrounding the nipples, and are in the adult virgin condition an inch and a quarter in diameter, or, in other words, each circle has a radius of five-eights of an inch from the centre of the nipple.

In the adult virgin the normal color of this circle is of a roseate or pinkish hue, gradually fading into the tint of the rest of the

breast as it approaches the circumference. On its surface may be seen from twelve to twenty or more slight glandular projections. During pregnancy the latter become more prominent, and the areola assumes a darker hue and a greater diameter (Fig. 47). The change in color is owing to turgescence, and most always occurs. It is much darker, and more characteristic in brunettes than blondes. In the former there actually is a deposit of pigment. These changes in the nipples and areolæ generally commence some time during the second month of gestation, and grow more and more decided as the full term approaches. Especially the color of the areolæ, which, in women of a dark complexion, occasionally becomes almost black toward the last.

If these changes in the circles surrounding the nipples were never produced except during gestation they would be almost infallible signs of that condition, but unfortunately they are now and then found independently of pregnancy. They sometimes occur in dysmenorrhœa arising from chronic ovaritis, and in other menstrual disorders, and in hysteria. Besides, in multiparæ the areolæ frequently remain permanently darkened, and their color may therefore be but slightly, if at all, changed by pregnancy. The darkening of the areolæ is of much greater diagnostic value in the nulliparous than in the multiparous woman, because this change is much more marked in the former than in the latter, and is rarely produced to the same extent by derangements or pathological conditions of the ovaries or uterus.

The deposit of coloring matter during pregnancy and the other states of the system alluded to is not always limited to the areolæ. Blumenbach mentions the case of a woman whose abdomen turned perfectly black every time she became pregnant, and Camper cites one still more remarkable of a female becoming brown at the beginning of pregnancy, and finally turning perfectly black as the period of parturition approached—the color gradually disappearing after the birth of the child. In many cases a dark line of about a quarter of an inch broad may be seen in pregnancy running along the linea alba from the umbilicus to the symphysis pubis. There is sometimes a dark circle surrounding the navel, and occasionally we find brownish streaks on the abdomen running parallel to each other. These streaks are usually curved, with their convexity toward the groin.

The Secondary Areolæ.—During the last few months of preg-

nancy, and not earlier than the fifth month, a number of discolored spots are often seen all around the areolæ where the color is less deep. These spots resemble those that might be produced on a tinted surface by drops of water, causing the color to fade a little where they happen to fall. They form around each true areola a circle, which is called by Montgomery the secondary areola. It is much fainter than the true, but is considered by him as a valuable and almost infallible sign of pregnancy.

Like the darkening of the true areolæ this change is most marked in women of a dark complexion. There may be an absence of any one, or of all of the areolar changes, and yet pregnancy be present.

Milk in the Breasts.—A drop or two of a serous-looking fluid can most always be obtained from the breasts during gestation, frequently as early as the latter part of the third month. That this fluid is somewhat lactescent in character can easily be ascertained by a microscopic examination. It gradually becomes more abundant, and assumes more of the qualities of true milk as gestation advances.

The presence of milk in the breasts is a very important evidence of gestation, and in a first pregnancy it may be regarded as an almost certain sign. It is of special value if detected about the third month in an unmarried woman, particularly if accompanied by the most prominent of the other mammary changes, and by a suppression of menstruation where the latter had previously been regular. I have already enjoined upon the physician the necessity of great tact and caution in making out a diagnosis in cases of suspected pregnancy in unmarried women. If space permitted I might cite many illustrations of the various ways to proceed in different consultations. The manner of dealing with these cases must be as variable as the difficulties to be overcome in reaching a definite conclusion. But very few unmarried women will admit to a respectable practitioner that they have run any risk of pregnancy until told positively that they are in that condition; and even then they will often assert that they must have been at the time in a deep sleep, or under the influence of an anæsthetic. It is rarely delicate or wise for the physician to put any direct question to such a patient on this point; and in the great majority of cases he must take the usual story for what it is worth of her catching cold during menstruation. If prudent he will not com-

monly undertake to bring on her courses by any treatment whatever, but will seek some excuse for delay in his diagnosis, or at most only treat some general disturbance of her system, until sufficient time has elapsed for the appearance of the mammary changes just described. When the proper time arrives it is an easy matter to find some excuse for looking at the breasts without explanation to the patient of the reason,—especially if she fancies some trouble of the heart or lungs, when auscultation of the chest will afford the opportunity. I have adopted this method many times when delicacy forbade my appearing to suspect pregnancy, or making a vaginal examination, and always with truthful results.

Having said thus much upon the importance of the presence of milk, especially when conjoined with other symptoms as a diagnostic sign of pregnancy in the unmarried, it is proper that I should call attention to the fact that in a few cases this fluid may be found in the breasts of virgins and very old women, and even in men. I gave in a former chapter an example of the latter. Montgomery and other authors furnish many examples of this nature where the milk was sufficiently abundant for suckling an infant. Dr. Livingstone, the great African explorer, saw an instance of a native woman of sixty years, who had long passed the childbearing period, giving milk sufficient for her grandchild, after repeated applications to her breasts of the child in order to cause a secretion, where there had been none for years.

We may also refer the reader to the remarkable case presented to the Academy of Surgery of Paris by the celebrated Baudelocque of a girl only eight years old, who had nursed her baby brother for more than a month.

But such exceptions as these to the general rule do not seriously militate against the presence of milk in the female breast being, especially in first pregnancies, and when accompanied with brownish colored areolæ and tubercles, a very valuable diagnostic symptom of gestation.

In women who have borne children it is not so reliable a symptom, for the reason that it is by no means uncommon for milk to remain in the breasts for a long time, even two or three years after the cessation of nursing. Although it be true that the presence of milk in the breasts does not infallibly indicate that the female either is or has been pregnant, yet non-professional people almost universally believe that it does. It therefore sometimes becomes

the duty of the physician to enlighten them upon this subject, in order to shield an innocent woman from the tongue of slander.

Œdema of the Lower Extremities and Other Parts.—There is generally more or less œdema of the extremities during pregnancy. The external genital organs are sometimes affected in the same way. This is usually owing to the pressure of the gravid womb against the veins conducting the blood from the lower limbs to the ascending vena cava. There are sometimes other causes in operation during gestation resulting in œdema and occasionally anasarca, such as anæmia, organic disease of the heart, and albuminuria.

Albuminuria.—I must beseech the young practitioner, whenever consulted concerning œdema of the lower extremities or anasarca, by a pregnant woman, to examine her urine, both chemically and microscopically, in order to ascertain the presence or absence of albumen and urinary casts. He will not be in the practice of his profession very long without learning the fearful import of the presence of a large proportion of either of these abnormal constituents of the urine. In the healthy unimpregnated condition of a woman there is no albumen in the urine; but during pregnancy there is generally more or less of it to be found. A small quantity of it, if not associated with the presence of granular and other casts of the urinary tubes, is not considered as a pathological condition. It is quite a different thing, however, when the urine is loaded with albumen, particularly when associated with granular nephritis. Under these circumstances it is necessary for the accoucheur to take more than ordinary care of his patient, especially about the period of parturition. This subject will be more fully discussed under the head of diseases of pregnancy.

Kiestein.—The presence of a peculiar substance called kiestein in the urine of an adult female was formerly considered by many authors as pathognomonic of pregnancy; but much less importance is attached to it at the present day, owing to the fact of its being occasionally found in the urine of the non-pregnant woman (especially if she has been taking cod-liver oil), and even in that of man, and is sometimes absent in the urine of the woman with child. However, it is of some value as a diagnostic symptom when associated with other signs of gestation, and therefore requires a brief notice

It was not unknown to the ancients, being described in 1486 by

Savonarola, but not under its present name. It has been more carefully studied within the last forty years, more especially by Golding Bird.

When it is desirable to ascertain the presence of this substance, the urine should be allowed to stand in a cylindrical vessel exposed to air and light, but entirely protected from dust, for a period of from two to ten days. At a variable time, from thirty-six hours to eight days, a flocculent material or cotton-like cloud forms in the centre of the urine, and very soon thereafter breaks up into numerous minute opaque bodies, which rise and form a fatlike scum, covering a part or the whole of its surface. It is of sufficient consistence to be raised from the urine. In about three or four days this pellicle gradually breaks up into small flocculent particles and settles at the bottom of the liquid. Under the microscope this film is found to consist of phosphate of lime, of the triple phosphate of lime, magnesia, and ammonia, a large proportion of vibriones, and some traces of fat.

Kiestein may be detected in the urine between the second and eighth month of pregnancy—rarely earlier or later. Some authors believe it to be analogous to casein; but others state that it is variable in composition, being composed of vaginal discharges, mucus of the bladder, fatty infusoria, and free phosphates.

Changes in the Blood.—The modifications produced in the blood as a result of pregnancy, although of little practical importance as means of diagnosis, because they cannot usually be made available, ought to be referred to, if for no other purpose than to show the remarkable change in opinion of the medical world upon the subject within the last few years. It was formerly almost a universal belief among the profession that pregnancy was generally associated with a plethoric condition of the system, and that many of the unpleasant sympathetic symptoms of gestation, such as palpitation, headache, shortness of breath, and singing in the ears, were attributable to this state of the blood. Hence, the practice in those days of placing a pregnant woman upon antiphlogistic regimen and treatment, which means low diet and the use of depressive, as well as depletory agents. Consequently it was the custom to practice venesection, especially during the latter months of pregnancy, simply for the purpose of lowering the supposed plethoric condition of the system, even when the woman enjoyed good health.

Although bloodletting has been almost universally abandoned by the medical profession in the treatment of supposed plethora of pregnant women, as well as in diseases generally; yet its supposed usefulness has taken such a deep hold upon the popular mind that it is, even at the present day, occasionally requested by patients.

Several late authorities adopt the views of Cazeaux, who asserts that the blood of pregnancy bears a closer resemblance to its condition in anæmia than in plethora, especially after the fifth or sixth month. In the early part of gestation there is but little change in the blood from the normal standard; but in the latter months there is found to be a great diminution in the red globules, which, according to the analysis of Rodier and others, bear the ratio of about one hundred and eleven against one hundred and twenty-seven in the non-pregnant condition. The quantity of fibrine, on the contrary, is vastly increased, especially during the latter months of gestation. Although even this constituent is sometimes slightly diminished in the early part of pregnancy. The increase of the fibrine helps to explain the frequency of thrombosis during gestation and parturition.

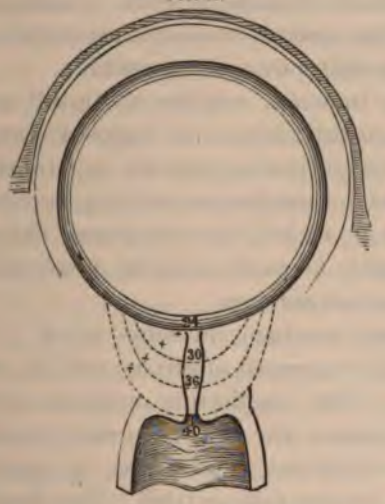
Cazeaux, mainly, has been instrumental in turning the current of professional opinion from a firm belief in a plethoric, to an equally firm one in a chlorotic, or almost chlorotic condition of the general system; and he seems to desire to be understood that this anæmio-chlorotic state is the normal one of pregnancy, and should be treated in the same manner as chlorosis, by the administration of chalybeates, etc.

This is surely going to an extreme. If his theory were true, we would have to look upon gestation as a pathological, rather than a physiological, condition. It is doubtless true that the system in many cases of pregnancy is really in a true anæmio-chlorotic condition, but it appears highly improbable that this is the usual or normal condition. However, as before stated, it seems to be well established that the blood in pregnancy approaches more nearly to the condition of chlorosis than to that of plethora, and that bloodletting, even if it had not been discarded as an antiphlogistic measure, would not at the present day be considered as indicated in the treatment of pregnancy. In fact, as a rule, the pregnant woman does not need any regular medicinal treatment. Let her simply observe the ordinances that nature has pointed out

for her guidance, by taking a due amount of exercise in the open air, by eating wholesome and digestible food, by securing a full allowance of quiet sleep, by keeping her mind contented and happy in the ordinary duties of her household, by avoiding luxurious habits, late hours, late suppers, and round dances; in short, by repudiating any and everything calculated either to unduly excite her mental or physical system, and by partaking in due moderation of everything that nature bids her use, she will be rewarded by good health during gestation and an auspicious parturition.

Changes in the Cervix Uteri.—The views originally propounded by Désormeaux of the gradual shortening of the cervix

Fig. 48.



uteri during the latter three or four months of pregnancy by dilatation from above downwards, are so simple, and have been so generally received by the profession, that it would seem to be almost a crime to dissent from them, except upon the strongest kind of adverse evidence. They are illustrated by drawings, to be found in nearly all our standard works upon obstetrics. According to these drawings, the cervix is described as losing about one-third of its length in thirty weeks, two-thirds in thirty-six weeks, and to become obliterated during the last few weeks of pregnancy. Figure 48, taken from Schultze's plates, represents the invasion of the cervix uteri according to the ideas originally

entertained by Désormeaux. It is there shown how the cervix is gradually encroached upon from above downwards by the development and expansion of the uterus after the twenty-fourth week of gestation. The circle represents the uterus, which at the end of the sixth lunar month is globular. The two lines inclosing the figures denote the boundaries of the spindle-shaped cervical canal at the same period. The dotted lines and figures represent the gradual expansion of the cervical canal, and the manner of its being taken up into the cavity of the uterus at the thirtieth, the thirty-sixth, and fortieth week of gestation. The crosses are intended to mark on the wall of the uterus the site of the original os uteri.

Weitbrech, in 1750, opposed these views, supported by Stoltz in 1826, and by Mathews Duncan in 1868. Cazeaux, Arthur Farre, and numerous other modern accoucheurs sustain this opposition, which seems to be rising into the ascendant.

Considering the immense number of digital and other examinations made by obstetricians at all stages of gestation, it appears, on a first view, strange that a question apparently so simple cannot be settled in such a manner as to bring conviction to the mind of every one. But it should be remembered that a decisive examination cannot easily be made without great risk of the production of abortion or miscarriage.

There is a natural tendency in some minds to adopt extreme views upon warmly contested questions, and in others to assume a middle course. The conflicting opinions advanced by eminent practitioners upon the subject under consideration, form a fair illustration of this fact; and serve to convince us that the question is by no means fully settled. The opponents of Désormeaux have succeeded in convincing the medical profession that his theory is not applicable in all cases, and in raising serious doubts as to whether it should not be discarded altogether. All parties admit that there is a real shortening during the *last two or three weeks* of pregnancy, but differ in their explanation of its cause. Some believe that it is owing to the incipient, painless contractions of the womb, preparatory to parturition; the cervix, they assert, being thus dilated at the expense of its length.

The warmest opponents to the views of Désormeaux admit that there appears to be a shortening of the cervix in nearly all pregnant women, especially in primiparæ, during the last four or five

months of gestation, but they deny that it is true shortening, and assert that the deception is owing to the softening of the neck of the uterus, or a disappearance of the characteristic hardness of that portion of the cervix that projects into the vagina, thereby altering the sense of touch so completely as to deceive the examiner into the belief of a real, when there is only an apparent shortening. Perhaps if Désormeaux were living he might be able to refute some of these plausible objections to his beautiful and ingenious theory. But the opposition to his views is not based entirely upon a theoretical basis, for it is claimed that it has been shown by numerous post-mortem examinations during the latter months of gestation that the cavity of the neck of the womb does not as a rule become shortened until two or three weeks prior to childbirth. It is affirmed that this may also be demonstrated on the living subject when the cervix happens to be very much relaxed and dilated, as is occasionally the case in women who have had many children.

So in the future we must be prepared to see drawings of a somewhat different character in illustration of this subject from those that have become classical in the profession.

Softening.—The softening of the cervix uteri seems to be necessary to its expansion, no matter whether this commences at the internal os, and continues downwards until its cavity is reduced to a mere circle or ring, or begins, according to the theory of Stoltz, at the external os and passes upwards. It is also a necessary preliminary to the final dilatation during labor. Besides, it affords the practitioner one of the most reliable symptoms for differentiating pregnancy from a number of pathological conditions with which it might be confounded, as will be shown in the next chapter. For there is a marked difference between the firm, hard, and non-elastic cervix uteri of the non-pregnant, and the softened cervix of the pregnant woman, especially during advanced gestation. The softening process commences at the external os as early even as the termination of the first month according to Cazeaux, and continues slowly and gradually towards the os internum until the entire cervix is softened.

About the beginning of the fourth month the lips of the os tincæ assume a soft, velvety feeling, presenting to the sense of touch a sensation not inaptly compared by Cazeaux to that imparted to the finger in pressing on a table having a thick, soft

cover. At the commencement of the sixth month about half of the cervix has become softened, and at the end of the seventh month the whole of it.

The softening of the cervix is a very general concomitant of pregnancy, the only exceptions seeming to be those rare cases of previous hypertrophic elongation, or morbid induration of this part of the womb. Although the existence of softening may be considered a valuable, it is by no means a positive sign of pregnancy, because it may be the result of some morbid alteration in the womb or its appendices. Its entire absence, however, in a case where pregnancy would be impossible unless far advanced, is almost positive proof of the non-pregnant condition. For example: if the supposed pregnant woman had permitted no sexual intercourse for six months, and upon examination the cervix should be found to have undergone no softening, the practitioner

FIG. 49.

FIG. 50.

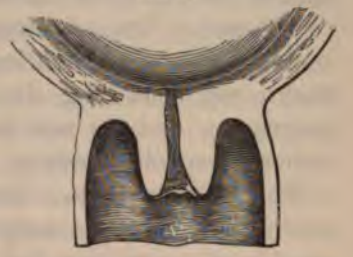
could feel almost sure that she was not pregnant, but he could not hazard a diagnosis upon this negative symptom alone, especially if contradicted by any positive signs of pregnancy. Coincident to, or as a result of the softening, the inferior portion of the canal of the cervix becomes enlarged, and its mouth more or less patulous. These changes occur to a greater extent in women who have borne children than in those pregnant for the first time.

In the former, during advanced pregnancy it is frequently possible to insert the finger the entire length of the canal of the neck, and even to feel the membranes covering the presenting part of the child. In the latter, however, the external os frequently remains closed until the termination of gestation, yet as a rule becomes, during the last two months of pregnancy, sufficiently open to admit the tip of the index finger.

The difference in the successive changes of the cervix and the os uteri of a primipara and pluripara, as occurring in the course of the development of the uterus, is represented in the accompanying diagrams 49 to 54. Figures 49, 50, and 51 denote the changes

FIG. 51.

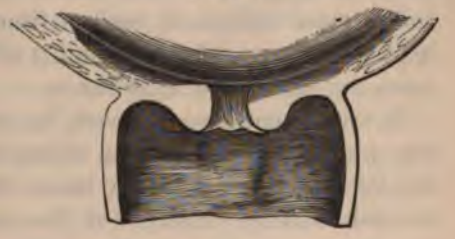
FIG. 52.



in the primiparous cervix and os at the twenty-fourth, thirtieth, and fortieth week of pregnancy, and Figures 52, 53 and 54 at similar periods in the multiparous woman. These illustrations are based somewhat upon the old theory of Désormeaux, as represented in Figure 48, as to the commencement of shortening of the cervix about the sixth month, yet indicate, so far as the pluriparous cervix is concerned, that the dilatation may commence from

FIG. 53.

FIG. 54.



the external os uteri, as asserted by Stoltz, instead of the internal os, as believed by Désormeaux. Mathews Duncan believes that the cervical canal is not encroached upon until the last few days of gestation. I have already stated that many other distinguished physiologists, pathologists, and accoucheurs assert that there is no real shortening of the cervical canal until the last two or three weeks of pregnancy. This whole subject needs further and more careful investigation.

Respiration.—Of course the respiration must be more or less affected in advanced pregnancy, owing to the upward displacement of the diaphragm by the pressure of the gradually enlarging womb. But not so much as would be the case if nature did not provide a moderate compensation in an increased width of the base of the cavity of the chest.

Abdominal Enlargement.—Under the head of changes in situation and anatomical relations in the last chapter we had a good deal to say concerning the enlargement of the abdomen during pregnancy, and do not deem it necessary either to repeat or elaborate our observations.

Fœtal Movements.—The movements of the fœtus in the womb undoubtedly occur as early as the muscular tissue of the fœtus is capable of contraction, but the mother does not feel them until the end of the second, and sometimes not until the eighth month. In the great majority of cases the mother becomes aware of the motions for the first time about the end of the seventeenth week. The fœtal movements, when first felt by her, receive the name of *quickening*, which the ancients very absurdly believed to be evidence of the very commencement of vitality in the fœtus.

As physiology, in the early days of medical art, was, as a science, entirely unknown, it is not very strange that such a theory should be inculcated. But it is almost incredible that one of the most enlightened nations of modern times should, until recently, have had a law upon the criminality of abortion founded apparently upon the same false hypothesis.

It was at one time believed, by some accoucheurs, that quickening was owing to a sudden rising of the uterus from the true to the false pelvis. We now know that, as a general rule, there is no such sudden elevation of the womb, but that the ascent is a simple process of gradual evolution. Besides this negative proof there is abundant other evidence to show that the quickening is not a passive motion, resulting from the sudden rising of this organ, but is really the active movements of the fœtus itself. This question can be easily determined by an experienced practitioner by the vaginal touch and abdominal palpation.

Although quickening is not the impulse given by the assumed sudden rising of the womb, there is little doubt but that the fœtal movements to which it is due are generally first felt by the mother after the ascent of the uterus into the abdominal cavity, so that

the impulse of the fœtus can be transmitted to the mother's abdominal walls, and appreciated by the sensory nerves of the latter.

To repeat, the quickening is the first manifestation of the fœtal movements, not the first movements themselves. That there is motion of the fœtus, prior to the sensation of the same being appreciated by the mother, has been proved in abortions where vigorous motions have been seen in the embryo after expulsion, at a period earlier than quickening has ever been observed by the mother. In examinations of the abdomen by the stethoscope, and by palpation, we are also sometimes enabled to hear and feel motions before they are recognized by the mother.

The sensation of fœtal movements is usually, at first, a feeble fluttering, causing occasionally unpleasant nervous sensations. The movements become gradually stronger in proportion to the growth of the fœtus. In advanced pregnancy they assume the character of decided kicks or blows, so hard, in many instances, as to produce distinct projections of the mother's abdomen. I have known ladies to be greatly annoyed by the sudden and tumultuous motions when they happened to occur in the presence of other persons, especially if the attention of the latter was directed to them by the innocent questioning of some sharp-eyed youngster. They not unfrequently produce severe pain. The motions consist mostly in the flexion and extension of the lower limbs of the child. They are not continuous, but recur at very irregular periods.

Sometimes they are absent for several days in succession, and again they may be in activity every few minutes or hours for two or three days. The mother's health has a considerable influence over them. They are supposed to be more vigorous after long abstinence from food on the part of the mother, and under any circumstances interfering with the vitality of the fœtus.

The obstetrician can generally satisfy himself as to the true character of the movements by careful abdominal palpation. He can also generally produce them by dipping his hands in cold water and suddenly applying them to the abdomen, one on each side; or, without the use of water, by simply pressing inwards with one hand, when the motion produced may be recognized by the other hand. In some cases, however, it becomes necessary to press the enlarged uterus in various directions in order to induce fœtal motion. The pressure should, of course, be intermitted, so as to allow

time in the intervals for the motions to be appreciated by the hands when quietly resting upon the abdomen.

The fœtal movements give us a most valuable diagnostic sign of pregnancy, and constitute, in addition, evidence of the vitality of the fœtus. With care, they can almost always be determined in the advanced state of pregnancy; but there are several sources of fallacy, of which the student should be made aware. Even women who have borne children have often been deceived as to the existence of fœtal motion, and, of course, it is easier still for those who have never undergone this experience to be led into error. The usual sources of fallacy are to be found in the movements of wind in the intestines, irregular contraction of the fibrous tissue of the bowels, or of the muscles of the wall of the abdomen. Even the throbbing of a large artery, or aneurism, communicated through a large abdominal tumor, may give rise to a mistake. It behooves the practitioner, under these circumstances, to exercise much caution, if he desires to prevent a ridiculous blunder. Nervous and hysterical women, especially those very anxious for children, are the most easily misled by false motions. Although it is commonly very easy for the experienced practitioner to solve, in advanced pregnancy, the question as to the truth or falsity of the motions, he will sometimes find himself in doubt, especially if the woman be very fat and have other symptoms of pregnancy, such as the suppression of the menses, enlarged breasts, nausea or vomiting, and false pains. Strange as it may seem, all these prominent symptoms may appear and the supposed pregnancy be spurious.

Spurious Pregnancy.—This spurious pregnancy may occur at any period of childbearing life, but is more common about the climacteric period, though it may take place in married women of any age, who are very desirous of having children, or in unmarried females who have run the risk of becoming pregnant. It is sometimes owing, especially about the period of the menopause, to ovarian irritation.

What is most singular about these spurious cases is, that the deception on the part of the woman may not only continue during the entire period of nine months, but that precisely at the expiration of this time she may be taken with severe rhythmical pains, in no respect differing from those of labor.

Although I have seen several examples of spurious pregnancy,

I remember but one case where real labor was simulated. I was engaged to attend the woman in confinement. It is true that I was never asked or permitted to examine her until sent for at the time of her expected confinement, so that I had to rely mainly on her own statements as to her symptoms. But there was no doubt as to the enlargement of the breasts and abdomen, and none in regard to the spurious labor-pains, which set in exactly on the day of her expected confinement. She stated that she had occasional morning sickness during the second month, and thought that she had frequently felt fœtal movements during the last three months of her supposed pregnancy. I, of course, made an examination as soon as summoned, and had no difficulty in pronouncing it to be a case of spurious pregnancy, as there was no softening or shortening of the cervix uteri, and no enlargement of the uterus. Under the circumstances it was unnecessary to examine for the absence of fœtal sounds, or to administer an anæsthetic in order to confirm my diagnosis. In this case, the enlargement of the abdomen was owing, partly, to an increase of adipose tissue of the same, but chiefly to wind in the intestines. The pain may have been owing to the flatulence and hyperæsthesia of the uterus.

When a physician is summoned to a case of spurious pregnancy, and the abdominal swelling interferes in any way with his examination or diagnosis, he should administer, by inhalation, chloroform, ether, or some other anæsthetic, and he will be surprised at the rapidity of the disappearance of the phantom swelling, especially if it be owing mainly to wind in the bowels. It will generally, however, return when the influence of the anæsthetic passes away.

CHAPTER X.

SYMPTOMS AND SIGNS OF PREGNANCY, CONTINUED.

We shall continue the interesting subject of the symptoms and signs of pregnancy, by calling attention to a valuable symptom introduced to the profession chiefly by Dr. Braxton Hicks.

Intermittent Uterine Contractions.—If the hand be placed over the womb after it has risen above the true pelvis and become large enough to be felt, and this organ be grasped for a little while without the employment of any pressure or friction, it will gradually harden by contraction, which takes place every five or ten minutes on an average. In order to appreciate this symptom it is necessary that the hand should be retained continuously on the womb for some time. If this phenomenon only manifested itself during gestation it would be an invaluable sign, as it occurs whether the fœtus be living or dead. But unfortunately it takes place when the uterus is enlarged from other causes than pregnancy. Still it is a valuable symptom in differentiating uterine from other abdominal enlargements, and thus aiding in the diagnôsis of pregnancy; for when all extra-uterine tumors are eliminated the question of pregnancy becomes greatly simplified.

Ballottement.—We have already alluded to the *active* movement of the fœtus as being of great importance as a sign of pregnancy, and we shall now discuss the *passive* movements, called by the French, *ballottement*, and by certain English authors, *repercussion*. This essentially consists in giving a sudden upward motion of the fœtus in the liquor amnii by the finger introduced into the vagina, and then allowing the finger to remain perfectly steady in its original situation for a few seconds, when a gentle tap will be communicated to its tip by the descending fœtal body.

The test is practicable only when the quantity of liquor amnii and the size of the fœtus bear a certain proportion to each other, so as to permit the latter to float readily in the former, and not until the fœtal body is sufficiently large to impart an impulse to the examining finger through the uterine and vaginal walls. As these conditions are only found, as a general rule, between the fourth and seventh months of gestation, its practice is confined to this period.

The fœtus prior to the fourth month is too small, while after the expiration of the seventh month it can no longer be readily made to rise up in the amniotic fluid on account of its being relatively too large.

How to Practise it.—Ballottement may be practised with the patient placed in either of the usual obstetric positions—that is, on her back, with the knees drawn up, or on her left side, and even when she is standing up, but the best position is midway between lying and sitting, as then the long diameter of the cavity of the uterus is made to correspond with that of the cavity of the true pelvis. The bladder and rectum ought to be emptied. The uterus is then steadied by the left hand being placed over the abdomen, while the index or the index and middle fingers of the right hand are introduced into the vagina and are brought to bear against the uterus just anterior to the cervix.

Fig. 55.

(After Tyler Smith.)

If the woman be placed in a horizontal instead of a semi-recumbent position, it may sometimes be better to place the finger or fingers just behind instead of in front of the cervix, but always upon the *thin uterine walls* instead of just *beneath the inferior end of the neck;* for in the latter case there would be the whole length of the cervix intervening between the vaginal finger and the fœtus, while in the former there would only be the thin walls of the womb. If the cervix should be rendered thin by expansion then there could be no objection to placing the finger against it, but modern accoucheurs believe that this never occurs at the proper period for ballottement. In obscure or doubtful cases of pregnancy it may become necessary to place the woman by turns in the horizontal, semi-recumbent, and erect positions, and to apply the finger to different parts of the most dependent portion of the uterus.

The palmar surface of the fingers should look forwards and upwards (Fig. 55). If a sudden jerking motion be then given to the fingers against the wall of the womb, the fœtus, if present, will be floated upwards in the liquor amnii, and in a few moments it will fall down upon the tips of the retained fingers, imparting to them a peculiar impulse. The only things likely to lead to error are stone in the bladder and an anteflexion or anteversion of the womb. Since no other symptoms in these pathological conditions are to be found, suggestive of gestation, than the one afforded by ballottement, the latter symptom cannot easily mislead an experienced accoucheur. No diagnosis can be made by this method between a dead and a living fœtus.

Although ballottement when easily appreciable by the experienced physician is a very valuable sign of pregnancy, its absence must not be considered as proof of the non-existence of this state, for it may be wanting in placenta prævia, abnormal presentations, and in other conditions.

A similar result to that obtained by the regular or internal ballottement, as usually practised, may be gained by external ballottement, or palpation of the abdomen while the woman is resting in a horizontal position on her side with her belly projecting over the edge of the bed. One hand should be placed beneath the projecting abdomen, and, provided the walls of the latter are not too thick, a portion of the fœtus can be felt resting on the hand. The latter upon being suddenly pressed upwards will displace the former, which in a few moments will descend with a gentle impulse upon the hand, imparting a precisely similar sensation as in the regular internal ballottement. External ballottement cannot be practised as early in gestation as the internal operation, because it is necessary for the uterus to become quite large before it will rest sufficiently in contact with the abdomen for its performance. It is not so reliable as the regular or internal method.

I have stated that ballottement gives no results in the last six or eight weeks of gestation because of the great relative size of the fœtus. Upon the same principle it is not available in twin pregnancy at any stage, unless the children are very small, or the amniotic fluid unusually abundant.

External Manipulation.—In the diagnosis of pregnancy many modern accoucheurs, especially in Germany, are giving great prominence to *external manipulation*, including *inspection*, *palpation*,

percussion, and *auscultation*. These methods are particularly useful during the last month of gestation, as not only pregnancy itself, but even the different presentations and positions of the fœtus may then be made out, and in many cases where malpresentations or malpositions exist they may, by external manipulation alone, be rectified before labor commences.

Position of the Woman.—For the purpose of external examination the woman must be placed on her back in a recumbent position, with her head slightly elevated and her thighs flexed so as to relax the muscles of the abdomen. These muscles will often contract so firmly from apprehension on the part of the patient, or reflex irritation caused by the touch of the examiner's fingers, as to prevent a proper examination. Hence it becomes necessary, in order to obviate the contractions, to direct the patient to open her mouth and take full inspirations and expirations. The necessary relaxation occurs during the latter effort. The woman should remove her corsets and drawers, and all constricting bands from around her waist, and allow her abdomen to be exposed. A sheet ought to be laid over the lower extremities, and the chemise or sheet may be permitted to cover the abdomen, except during the examination, when no covering is allowed to interfere with the accuracy of the manipulation. The rectum and bladder should be evacuated.

Inspection.—By ocular inspection the practitioner may familiarize himself with the shape and dimensions of the abdomen, the form of the umbilicus, the appearance of the cutaneous surface, especially of the linea alba, and with the color of those marks or lines of the skin called striæ, when present, or he may note their absence. It does not require a great deal of experience in a physician to judge from the shape and size of the abdomen the approximate stage of gestation.

There are two kinds of marks or striæ of the skin, the red and white. When arising from pregnancy, the former indicate a recent distension of the skin or present pregnancy, the latter an old distension, or former pregnancy. But unfortunately, as they arise from excessive distension of any kind, especially of a chronic nature, as ovarian or abdominal dropsy, a fibroid tumor, or even simple obesity, and may be absent in pregnancy itself, they are only of secondary importance as a sign of pregnancy. During the latter months of pregnancy the umbilicus becomes less depressed,

and sometimes protrudes beyond the skin. As, however, the same thing occurs in great abdominal distension from any cause it cannot be considered characteristic of pregnancy.

In the Trans. Germ. Med. Association, 1875, Dr. Ludwig Bandl, of Vienna, asserts that in cases of abnormal obstruction to the passage of the child through the pelvis, such as pelvic contraction and malposition of the child, a distinct transverse furrow makes its appearance on the abdomen, about half way between the pubes and umbilicus, corresponding to the junction of the body and cervix of the uterus, resulting from the fruitless contractions of the uterus during its efforts at expulsion. As this phenomenon is said to occur only during abnormal parturition, it may ultimately prove of great practical value.

PALPATION.—By abdominal palpation, or the pressing of the palmar surface of all the fingers (not merely the tips) of both hands firmly into the abdominal walls, and gradually moving them from place to place over the abdomen, one may generally detect the shape, consistence, approximate size, presentation, and in many cases the position of the fœtus, before and at the beginning of labor.

The physician in using palpation should stand on the side of his patient, preferably the right, and having warmed his hands, place them on the bare abdomen and move them gently about until the muscles become accustomed to their presence. Notwithstanding this precaution the contraction of the abdominal walls, and of the womb itself, will not unfrequently interrupt the examination for awhile. To obviate the former, the method of inspiration and full expiration with the mouth open, previously alluded to, must be adopted. Sometimes the hands may be kept close together, sometimes separated, occasionally pressed lightly, and again deeply into the abdomen. Occasionally the womb may be pressed between them in different directions so as to ascertain its shape, consistence, inequalities, general configuration, and the position it occupies in the cavity of the abdomen.

The diagnosis may not only be made out by this method, but the period of gestation, and the presentation and position. Its use in determining the latter will be mentioned under the head of Mechanism of Labor in the different presentations, particularly of the face. As to the determination by it of the period of gestation it is only necessary to slowly pass the tips of the fingers over

the abdomen from below upwards, and to press them firmly inwards, when a point will be reached where resistance suddenly ceases and the fingers can be pressed almost to the spinal column, when the fundus may be grasped and recognized by its convexity and firmness. Its distance above the symphysis pubis or umbilicus, or below the latter or the ensiform process, will approximately indicate the period of gestation. The diagnosis of pregnancy by palpation alone is rarely possible before the sixth month, and the diagnosis of the presentation of the fœtus and of its distinct individual members is not possible, with very rare exceptions, prior to the seventh lunar month. From this time onward, however, the various positions of the fœtus become more and more distinct to the touch.

The head may be recognized as a hard, round, movable body; the breech as a more irregular, softer, and less movable mass; the back by its being a continuation of the breech, and by the resistance that it offers to the fingers, and by its regular outline in comparison with the softer and more irregular abdominal surface of the fœtus.

The arms and feet are known by their being small, irregular, sharply projecting, movable bodies, and sometimes by their motions. These characteristics apply particularly to the legs.

Percussion.—This method of external manipulation is, by itself, of but little practical importance in the diagnosis of pregnancy. It may be useful, however, as confirmatory of the other methods. It is serviceable, too, in those cases of great rigidity and thickness of the abdominal walls when palpation cannot be successfully performed; because, if the bladder be empty, the outline of the uterus may thus be traced, sometimes as early as the fourth month of pregnancy, particularly in cases of anteversion.

Auscultation.—The practical application of auscultation in the diagnosis of pregnancy is of equal value to its use in determining the pathological changes appertaining to the heart and lungs. In this connection the name of M. Mayor, of Geneva, should never be forgotten, for it was he who first announced in 1818 the fact that the sounds of the heart of the fœtus are audible during the latter half of pregnancy. Strange as it may appear his discovery attracted but little attention for several years. Its importance is at the present day universally acknowledged.

Position of the Patient.—Although the abdomen may be auscultated while the patient is sitting or standing, yet there are so many objections to these postures, especially as regards fatigue to the patient and the inability of using immediate auscultation when desired to advantage, that the dorsal decubitus with the lower limbs properly flexed, is in my opinion greatly the best position. If the stethoscope be used it may be applied directly to the abdomen, or have intervening between it and the latter a thin layer of unstarched muslin or calico—silk, wool, and starched covering being objectionable on account of rustling and other noises. In immediate auscultation the muslin or calico covering is necessary. Of course the bladder and rectum must be empty.

Immediate or Mediate Auscultation.—In auscultation of the chest in both sexes, and of the maternal abdomen for fœtal heart sounds, either the ear may be applied to the part or a stethoscope be intervened. The first mode is called immediate, and the second mediate auscultation. The profession is divided as to which is the better method. Not having space for the discussion of this interesting subject, I can only say that at least so far as abdominal auscultation is concerned mediate auscultation appears to be decidedly preferable. Until gestation is considerably advanced and the fœtus be risen above the brim of the pelvis, it is impossible to auscultate the fœtal heart by the unaided ear. The same difficulty does not obtain in the use of the stethoscope.

In the latter months of pregnancy both methods are applicable when the woman is in the dorsal decubitus, but it is far more embarrassing to the woman to have the physician apply his ear immediately upon the abdomen than through the intervening stethoscope. Besides it is very disagreeable to the medical man himself to have his face so near the external genitalia of the female, especially if there be any offensive discharge from these parts.

But whether the practitioner use mediate or immediate auscultation, he should when on the right side of the patient apply his left ear, and when on her left side his right ear. The binaural stethoscope is the best. It must be pressed firmly upon the abdomen so as to depress its walls, and no noise should be allowed in the room.

Of course, in order to secure reliable results, the operator should be experienced not only in the use of the stethoscope, but of the

particular kind used, especially if it be a binaural instrument; and should also have had practical knowledge in abdominal auscultation, as a good auscultator of the chest is not necessarily a good auscultator of the abdomen for fœtal heart, umbilical or uterine sounds. The chief opposition to the use of the stethoscope comes from practitioners inexperienced in its use.

As a rule the fœtal pulsations first become audible about the beginning of the fifth month. But many practical observers have been able to discover them, under very favorable circumstances, earlier. Depaul states that he has heard them even at the eleventh week. The profession look upon the latter statement with a good deal of incredulity. But it is believed that the pulsations may be heard occasionally at any period during the fourth month. Dr. Paul F. Mundé, of New York, in an article in the American Journal of Obstetrics, October, 1879, says: "I, myself, lately heard the fœtal heart distinctly (152 per minute) in a lady pregnant with her third child, in whom the last menstruation ceased exactly seventeen weeks to the day, before I made my examination. She had plainly felt quickening nineteen days before, that is, during the fourteenth week." By careful, and, if necessary, repeated examinations, they may almost invariably be heard during the last four months of pregnancy. The presence of extreme flatulency or other incidental or accidental conditions may obscure the sounds temporarily, but rarely during the entire period of gestation.

The great value of the pulsations consists not only in giving us by themselves an absolutely certain sign of pregnancy, but of fœtal life also. It is necessary, of course, to be careful not to confound the throbbing of the fœtal heart with that of the maternal bloodvessels. But as the former is so much more rapid than the latter it may nearly always be differentiated. There are times, however, when the mother's pulsations are so unusually frequent that great care becomes necessary. The fœtal sound consists of a double beat, separated by a slight interval; the first being the louder and more distinct, the second so faint as to be inaudible at times. It is generally compared to the double tic-tac of a watch transmitted to the ear through a pillow.

Slater, who has made a very large number of observations, gives the average number of pulsations for a minute at 132, the mini-

mum at 120, and the maximum at 140. Other observers state greater extremes for the lowest and highest number of beats.

In order to differentiate the fœtal and maternal pulsations we must always examine each separately, but at the same time This can be accomplished by placing the finger upon the wrist of the mother at the moment that we are applying the stethoscope to the fœtal heart, when the much greater frequency of the fœtal pulsations will nearly always be apparent.

But if, from any disturbing cause acting more on the mother than the fœtus, like mental excitement or fever, the maternal and fœtal pulsations should closely assimilate in frequency, a want of synchronism between those of the fœtal heart and the maternal arteries will assist in distinguishing the one from the other.

The fœtal heart-sounds remain in frequency about the same during the whole period of gestation from their first existence, but gradually increase in intensity with the advancement of pregnancy. Perturbing causes, however, may temporarily increase or diminish their frequency. The mere pressure of the stethoscope, by exciting rapid movements of the fœtus, may have the effect of increasing the number of beats.

For these and the following reasons, it will be seen that the manner of conducting auscultation of the fœtal heart is by no means a matter of indifference. It is highly important, for instance, for the physician to remember that the fœtal heart-sounds are never heard over the whole abdominal surface of the mother. On the contrary, the area of audibility is very limited and varies with the fœtal presentation and position, and, like them, becomes more constant as gestation advances. In order to save time and trouble, it is better to commence the stethoscopic examination at the point where the pulsation is most frequently heard. This is on the left side, midway between the anterior-superior spine of the ilium and the umbilicus, because the sound is best transmitted through the child's back, which is generally found looking forward and towards the left side of the mother.

The next most common area where the fœtal pulsation may be distinctly heard, is half way between the umbilicus and the superior spine of the ilium of the right side, because this corresponds with the second cranial position of the fœtus. In both this and the first cranial position, the back of the child is turned towards the abdomen of the mother, and therefore permits the pulsation

of the fœtal heart to be readily heard; but as the sounds have to traverse a greater space in the dorso-posterior positions of the child, whether of the head or breech, they are necessarily not so audible under the latter conditions. In breech presentations the heart-sounds are most distinctly heard above the umbilicus of the mother, and towards either the right or left side corresponding to the one towards which the dorsum of the fœtus is situated.

By ascertaining whether the area of pulsation is above or below the umbilicus, we can, especially when assisted by palpation, determine whether the presentation be of the breech or cranium. So by the greater or less audibility of the sounds we may form a pretty fair conclusion as to whether the position be dorso-anterior or dorso-posterior, and by combining this information with a knowledge of the side where the pulsation is heard, and of the site being either above or below the umbilicus, we may actually, in many cases, diagnose the presentation and position of the fœtus before labor commences without the aid of vaginal examinations. It is only recently that this has been considered possible. The application of auscultation in the diagnosis of fœtal presentations and positions will be alluded to again in Chapter XVIII.

Can the Sex be Ascertained Before Birth, by a Difference in Rapidity of the Heart of the Male and Female Fœtus?—Ever since Frankenhauser first announced his belief in the affirmative of this question, it has given rise to much discussion and a pretty general incredulity. He is of the opinion that the beating of the heart of the male is less frequent than that of the female fœtus—the former averaging 124, and the latter 144 pulsations to the minute. A few observers affirm that the difference lies not in the sex but the size of the fœtus, and that the pulsations are slower in the male than the female, because the former is generally the larger.

Some physicians place the average difference between the male and female much less than Frankenhauser states it to be.

The majority of medical men think the difference is only apparent, and arises from the examinations being made under circumstances calculated to mislead. For instance, Mr. Charles G. R. Naylor, of Edinburgh, found in his experiments, made in 1876, that the fœtal pulse invariably increased after meals by the mother, from four to thirty-two beats per minute. If this be so,

an auscultation before meals, if no allowance be made, would lead to the supposition of a male fœtus, and after meals to a female.

Doctors Paul Budin and Chaignot state, in the New York Medical Record for December, 1878, that according to their experiments there are no reliable differences between the fœtal pulsations of the sexes, as a high and a low number of beats are found indiscriminately in both male and female, and that the pulsations may vary from fifteen to thirty at different times in the same fœtus, and that a variation is occasionally observable during the same examination.

Can Twin Pregnancy be Diagnosed by Auscultation?—This question may be answered in the affirmative. This discussion, however, must be postponed until we consider the diagnosis of twin pregnancy in the next chapter.

Umbilical and Uterine Souffle.—The pulsation of the fœtal heart is the only sound of special diagnostic importance in relation to pregnancy, but there are others more curious than useful, to which attention may be called; such as the *umbilical* or *funic souffle* and the *uterine souffle*. The former is heard best in the immediate neighborhood of the sounds of the fœtal heart, and is synchronous with the latter. It is a single blowing murmur, caused, as most authors maintain, by pressure on the umbilical cord, either when it is twisted around the neck of the fœtus, or when it is caught between a hard part of the latter and the walls of the uterus.

The uterine souffle is of but little more value in diagnosis than the one just described. It consists of a peculiar single whizzing murmur, of variable character and position. At times it is harsh and loud, at others gentle, and even musical in tone. Sometimes it is heard at one part of the uterus, and again at another. The audible space may include the entire womb, or only a very small portion of the same. It can, by auscultation, almost always be heard after the end of the third month, and frequently prior to that period.

This sound was once known as the *placental souffle*, because it was believed that it originated in the vessels of the placenta; but as it may be audible after the expulsion of the latter it becomes necessary to trace its origin elsewhere. A few writers are of the opinion that it is caused by pressure upon the aorta and iliac arteries by the pregnant womb; but the majority of the best ob-

servers maintain that the sound has its origin in the vessels of the uterus itself. The conflicting theories in regard to its origin are scarcely worth mentioning, especially as the sound may be heard even when pregnancy does not exist, as, for instance, when the uterus contains a large fibroid tumor, or, in enlargement of the ovaries, and is, therefore, of little or no value in the diagnosis of pregnancy.

Differential Diagnosis of Pregnancy.—Having passed in review the most important symptoms of pregnancy, somewhat as a military inspector would his troops, by examining the qualities of each separately, we must next inspect them in groups, battalions, and regiments, in order to ascertain their value when thus combined.

We must also endeavor to eliminate from the true symptoms the false, and the various pathological conditions more or less assimilating pregnancy, that might lead us astray in forming a diagnosis. It is evident that a large number of the symptoms described would, in any combination whatever, only indicate a probable state of pregnancy. There are, however, three signs, when clearly made out, which would either individually or collectively be positive proof of this condition.

Certain Signs.—We may enumerate under this head:

1. The pulsations of the fœtal heart.

2. The active movements of the fœtus, distinctly recognized by a practitioner of great skill and experience.

3. The passive movements, ascertained by palpation and ballottement.

Any one of these signs, when positively present, would indicate pregnancy. But their absence is no proof of the non-pregnant condition unless substantiated by the want of some of the merely presumptive symptoms.

Probable or Presumptive Signs.—These are only valuable in certain combinations. Singly they only raise, as it were, a bare suspicion of gestation. But they may, when taken in groups, if all other sources of fallacy are duly eliminated, form an almost incontestable proof of pregnancy. Still, if they were all present, and the certain signs all absent, we could not declare positively that pregnancy existed.

Questions of pregnancy or no pregnancy often arise in our courts, where the most important decisions, involving property,

character, liberty, and even life itself, hang upon their solution by the medical fraternity. But in these days of advanced abdominal surgery they come under discussion still more frequently in the consulting chamber, where it is of the utmost importance that the gynæcologist should be able to solve them prior to undertaking any highly important operation. Errors in diagnosis under these circumstances have, unfortunately, been quite numerous during the last few years.

Aside from this, the practitioner will be constantly consulted, as I have already stated, by females in reference to this point; by some who desire children, and hope they have conceived; by others, who do not want them and fear they may be pregnant. Therefore I shall refer, in a general way, to some of the conditions most likely to mislead the physician, and will point out the method of distinguishing them.

The most likely source of error arises from that peculiar condition called *spurious pregnancy*, which has already been described.

Adipose Enlargement of the Abdomen.—This may embarrass the diagnosis by preventing the practitioner from being able to ascertain the size of the womb. Unfortunately, great obesity is frequently associated with irregular menstruation, thus adding additional obscurity to the diagnosis. Under these circumstances however, if the cervix uteri be hard, and there are none of the changes in the mammæ, as already described, and no fœtal pulsations, we may easily avoid being misled.

Tympanites.—Among the many enlargements of the abdomen tending to mislead the patient and obstetrician may be mentioned tympanites, or a swelling of the abdomen from flatus, or wind in the intestinal canal, or an accumulation of air in the cavity of the peritoneum. The medical man is often consulted by nervous, hysterical women, especially about the period of "the change of life," in regard to this enlargement, and if they are not particularly anxious to have children, he may, almost always, be able to decide the question of pregnancy by their admitting the inconstant character of the swelling, or its alternate increase and diminution. But if the female is extremely desirous of pregnancy it is astonishing how little information one can obtain from her in reference to this point. In that case an examination both by the *toucher* and palpation will be necessary.

The absence of uterine enlargement and the drumlike sound of

the abdomen on percussion, will generally enable him to eliminate pregnancy, or the administration of a strong carminative cathartic will satisfy his patient and her friends by the disappearance of the enlargement so soon as the medicine shall have acted on the bowels. Occasionally, the inhalation of an anæsthetic will not only quickly dissipate the swelling, but afford assistance in the necessary examination.

Physometra.—This consists in the distension of the womb by the accumulation of air or gas within its cavity. The origin of the gas is frequently in the decomposition of animal matter within the uterus, such as a mole, fœtus, or retained placenta. By conjoined manipulation it can be ascertained that the organ is unusually light, and percussion gives a distinct, resonant sound, differing in both these respects from the weight and dulness of a gravid uterus. There is also, in some cases, a variation in its volume, owing to an occasional escape of its gaseous contents. Physometra is a rare disease.

Hydrometra.—This is a dropsical affection of the womb, almost as rare as the pathological condition just described, and is generally dependent upon some constitutional disorder. It is best diagnosed by the fluctuation produced upon proper percussion. Of course, the history of the case and the constitutional disease associated with it will materially assist us in forming an opinion of the malady.

Retention of the Menstrual Fluid.—This condition, by its resemblance to the cessation of menstruation from pregnancy, and by giving rise to enlargement of the womb, as in the early months of gestation, and by the frequent production of gastric derangements, mammary changes, and other sympathetic phenomena, is a prolific source of fallacy in the diagnosis of pregnancy.

If upon examination of a young woman during the menstrual age, who has never had her courses, we find an imperforate hymen, or os tincæ, and a fluctuating swelling in the vagina or uterus, our diagnosis may be quite easy and the treatment clearly indicated; for pregnancy might easily be excluded under these circumstances.

But the case is quite different in young women who have menstruated, and in married ladies especially; for an examination of the cavity of the womb by a sound or otherwise would almost inevitably produce abortion if pregnancy existed; and we are thus

debarred from one of the best means of diagnosis. However, periodic attacks of pain in the region of the womb, from monthly additions to the retained menstrual fluid, the non-conformity of the swelling in many cases to the gradual enlargement of the uterus during gestation, a careful elimination of many false symptoms, and above all a history of the case, and a thorough examination by palpation externally, and the toucher per vaginam and rectum, and auscultation after the third or fourth month, and ballottement between the fourth and eighth months, and by other means, we may almost always arrive at a true diagnosis.

In alluding to the imperforate hymen and occluded os tincæ, I should have stated that the former condition, as a cause of retained menses, is almost entirely confined to young unmarried females, but that the latter condition may be found in women of any age, either married or single. The term *atresia* is now usually applied to an imperforation or occlusion of any part of the utero-vaginal canal, and is divided into the congenital and the accidental, and partial and complete. It may be located in the cervix uteri or any part of the vagina. It is found mostly in fe . ales who have had abortions or children, or inflammation of tl. utero-vaginal canal. Sometimes when the atresia is incomplete a portion of the menses may escape externally, but sufficient is often retained to form clots, which in the course of time become decomposed and are followed by a train of symptoms particularly harassing and troublesome to the patient, and resembling in some cases threatened abortion.

Complete atresia is of course more liable to simulate pregnancy than the incomplete. Imperforation of the hymen and atresia of any part of the utero-vaginal canal require surgical treatment, which the student will find laid down in any of the standard works on gynæcology—especially in Barnes's and Thomas's. The former condition requires only a very simple operation, but the latter often demands considerable surgical skill.

Engorged and Enlarged Uterus.—This accompaniment of several varieties of disease of the womb might be mistaken for pregnancy when complicated with suppression of the courses. If the attendant pain and tenderness of the uterus, and inability to walk, be insufficient to enable us to exclude gestation, we should wait awhile, as time will clear up the matter by showing that the

uterine swelling does not gradually increase in size in proportion to the duration of the supposed pregnancy.

INTRA-UTERINE TUMORS.—These morbid growths are fruitful sources of error to the physician. There are, however, several marks of distinction by which the intelligent observer may generally avoid being misled, such as the commonly slower growth of these tumors, their tendency to frequent and in some cases almost constant bearing-down pain and hæmorrhage, which are often greatly augmented about the menstrual periods. These distinctive features are particularly applicable to both polypoid and fibroid tumors. The hard nodular masses of the latter form of tumor will also aid in the diagnosis. This growth occasionally becomes immense, distending the abdomen much more than a pregnant uterus at full time.

The absence of auscultatory phenomena and of cervical softening in the non-gravid condition of the womb must also be taken into account. The occasional presence of a *souffle*, which may sometimes exist where there is only a morbid growth instead of a fœtus in utero, may cause some embarrassment in the differential diagnosis, unless it be remembered that where this is heard in pregnancy there should also be fœtal movements and pulsations. Yet it must be borne in mind that these tumors, as well as others to be mentioned, may coexist with gestation.

EXTRA-UTERINE TUMORS.—Large tumors, especially of the fibroid variety, may be attached to the outside, as well as the inside of the uterine walls. Unlike the internal growths, they rarely, if ever, become malignant, but occasionally produce death by pressure upon the digestive apparatus, and by thus interfering with nutrition. There are commonly several of these tumors. They vary in size from an egg to a large pumpkin, and are characterized by great mobility because their attachment to the uterus is by a pedicle.

It is often possible for the examiner to press his hand edgewise between these tumors, so as to determine their multiple character and to separate them in a measure from the womb itself, thus eliminating pregnancy, and in fact all intra-uterine swellings.

OVARIAN ENLARGEMENTS.—The most common form of ovarian enlargement is dropsy, which is recognized by fluctuation under the application of palpation and percussion, thus separating it from pregnancy. In regard to enlargement of the ovaries it is always

wise to inquire into the history of the case, particularly as to whether a tumor had been observed in the abdominal cavity before the time of the suspected pregnancy, and in relation to its site. If the tumor be ovarian we shall learn that it commenced in one or the other of the iliac regions, instead of in the lower part of the hypogastric region, as would naturally be the case if the enlargement were uterine. The gradual ascent of an ovarian tumor is apt to be more oblique than that of the uterus. Fœtal pulsations, when discovered, of course fully decide the diagnosis in favor of pregnancy. The prolongation of the enlargement beyond the natural period of gestation would also enable us to eliminate gestation. But when the latter condition and ovarian enlargement exist at the same time it frequently becomes very difficult to arrive at a satisfactory conclusion.

The presence of menstruation will, as a general rule, prevent our mistaking ovarian disease for pregnancy, as we would naturally be inclined in such a case to exclude the latter condition for the former, as the menstrual flow generally continues during ovarian enlargement, and is mostly absent during gestation.

A vaginal examination conjoined with abdominal manipulation will usually enable us to discriminate one condition from the other by finding the size of the womb and the state of the cervix uteri. The latter in pregnancy will be found soft and relaxed, and the former increased in magnitude, while in ovarian disease there is no, or but little, change in this respect.

Ascites.—Ordinary care and experience will enable us to distinguish ascites from pregnancy. There is no tumor as in pregnancy, but a uniform swelling and fluctuation, with dulness on percussion in the most dependent part, and resonance at the most elevated portion, conjoined with the absence of any change in the neck of, or in the womb itself. When, however, there is a complication of pregnancy and ascites, the diagnosis is frequently very difficult. Under these circumstances, we are apt to be led into the error of supposing the case to be a disease of the ovary, complicated with abdominal dropsy. The changes of the cervix uteri and mammæ attendant upon pregnancy will greatly aid us in such a position; so will the symptoms afforded by ballottement and auscultation, where these are not rendered unavailing by the ascites.

CHAPTER XI.

PREGNANCY, CONTINUED.

We shall next proceed to the consideration of the *duration of pregnancy.* This subject is not as simple as popular opinion might lead us to suppose, at least so far as it relates to the human female. In fact, we are unable, in the large majority of cases, to decide exactly when conception may have taken place, so as to secure a commencing point in estimating the duration of pregnancy. We may generally tell within one or two weeks, if all the facts are truthfully laid before us, and sometimes within a few days when there has been but a single coitus. But it is necessary to be extremely cautious how we receive the evidence bearing upon the latter point, particularly so far as it relates to unfortunate single women, who, when they can no longer conceal their shame, will admit a single indiscretion, but rarely any other. It is, of course, utterly impossible in the case of married women, where intercourse occurs frequently, to fix upon any definite period of conception, except under peculiar circumstances. But even in instances of only a single connection succeeded by pregnancy, it is not possible to state the exact hour of conception, for the reason that this may not take place for several days subsequently. As we know that in many of the lower animals fertilization of the ovule does not occur for a short but indefinite period after insemination, it is highly probable that the same law extends in a modified form, to the human female. What adds strength to this probability is the fact that living spermatozoa have been found in the genital canals of women several days after sexual connection.

Methods of Calculating the Periods of Labor.—As it is utterly impossible, in the great majority of cases, to ascertain in the human female the period of conception, we must avail ourselves of other resources as starting-points to calculate the duration of pregnancy. We are greatly assisted in determining this proposition in the abstract sense by reference to experiments upon such of the lower animals as most resemble the human female in the manner and time of bringing forth their offspring. Before

alluding to this comparative view of the subject, we shall state that the most practical method of approximating the duration in order to meet the daily emergencies of a busy professional life, is to calculate from the cessation of menstruation. This plan is almost universally adopted both by the patient and physician.

Taking this as our basis we, of course, can only arrive at the probable duration of pregnancy in any given case; for aside from the fact that this is not absolutely a regularly definite period, we are liable to error, because impregnation, though perhaps generally occurring within the subsequent ten days of the last menstruation, might not take place until just prior to the time the flow should have shown itself again, or about twenty-five days from the cessation of the last menstruation. To add to the difficulty, a few women have their courses after impregnation for a period or two, and, in very rare instances, regularly during the whole time of gestation. Nevertheless, as a rule, the time of parturition may be ascertained sufficiently well for all practical purposes by ascertaining the first well day after the last menstruation, and adding thereto nine calendar months as the soonest, or ten lunar months as the latest period for her expected confinement.

Duncan's Method.—A very good rule is that laid down by Dr. Mathews Duncan, who has investigated this subject more fully than almost any one else.

His directions are: "Find the day on which the female ceased to menstruate, or the first day of being what she calls 'well.' Take that day nine months forward as two hundred and seventy-five days, unless February is included, in which case it is taken as two hundred and seventy-three days. To this add three days in the former case, or five if February is in the count, to make up the two hundred and seventy-eight.

"This two hundred and seventy-eighth day should then be fixed upon as the middle of the week, or, to make the prediction the more accurate, of the fortnight in which the confinement is likely to occur, by which means allowance is made for the average variation of either excess or deficiency."

A short way of reckoning the date of confinement usually adopted by myself is to add seven days to the first well day succeeding the last menstruation, and deducting from this three calendar months, to obtain the day and the month, although, perhaps, not the year of confinement. This is, in one sense, the same as

adding nine calendar months and seven days to the first well day after the last menstruation.

Professor A. R. Simpson's Rule.—In calculating the duration of pregnancy and period of labor, Professor Alexander Russell Simpson, a nephew of Sir James Y. Simpson, adopts the unproved and somewhat fanciful theory of Lowenhardt, that gestation bears a definite relation in its duration to the time of maturation of the ovum of the pregnant woman. He lays down the following rule: "Find out the number of days between the commencements of the two menstruations that preceded conception, and multiply the figure by ten; and within a range of five days, earlier or later, the birth of the impregnated ovum will probably take place."

Although this rule may occasionally hold good, there is too much variation in the menstrual nisus among women to make it practical. When based upon the extremes of menstrual periods—three weeks and three months—it would make a duration of pregnancy in the former only two hundred and ten, and in the latter about nine hundred days.

Can the Time of Labor be Estimated from the Period of Quickening?—As already stated, quickening is not the first active movements of the fœtus, but the first sensation of these movements by the mother. It is the belief of patients generally and of many authors, especially Cazeaux, that the most common period of quickening is four and a half months after conception, or before labor. A majority of the latest and best authorities place the time at the seventeenth or eighteenth week of pregnancy, or about the end of the fourth calendar month. It may occur earlier or much later. Owing to the irregularity of the period of quickening and the fact that many women are deceived as to its presence, it is of itself a very unreliable guide for calculating the period of labor, but is useful in cases of pregnancy where the period of the last appearance of the menses is unknown, or where the latter are normally absent, as during lactation.

A knowledge of the duration of gestation is not only useful as one of the means for ascertaining the probable date of parturition, but is of the highest importance in a medico-legal point of view. The question of legitimacy has frequently to be settled in our courts of justice, and often depends for its solution upon what is considered the duration of pregnancy.

Considering the social standing of the parties concerned, the

eminence of the legal talent arrayed on both sides, and the professional status of the medical experts called upon for their opinions, the well-known Gardner peerage case, tried before the House of Lords of Great Britain, in 1825, is one of the most interesting on record.

It would be hardly possible at the present day to find three well-informed physicians who would agree with Sir C. Clarke, Dr. Gooch, and Dr. Davis in the opinion they expressed during that trial that the duration of gestation never exceeds forty weeks or two hundred and eighty days, for the reason that since then the attention of the medical profession has been more closely called to the investigation of the subject. We now know that pregnancy may be protracted about a month beyond that period.

Aside from numerous proofs afforded us upon this point in the human female, we are supported in this view by many experiments upon a large scale made upon the inferior animals—particularly mares and cows. In the latter, and in the mammalia generally, one coitus is usually followed by conception if having taken place during the period of rut. By separating the females from the males until after the former shall have brought forth their young, it is an easy matter to calculate the duration of gestation in each animal. Experiments of this nature have proved that pregnancy may vary considerably in duration. For instance, it has been ascertained that the mare will sometimes exceed the calculated time by forty-three days, and the cow by forty-five days. Aside then from proof almost positive occasionally afforded us by the woman herself, we have the absolute certainty of evidence from these experiments of the inferior animals most closely allied to her in this respect, to sustain us in the opinion of the *variability and occasional protraction of gestation in the human female.*

Although the fact is at the present day generally admitted, yet obstetricians have not yet been able to fix upon the extreme limit of protraction. It probably does not much exceed a month.

A prolonged pregnancy is often associated with a large development of the child, but, contrary to the opinion of Dr. Duncan, not necessarily, or, perhaps, generally so.

Joulin and others relate cases of protracted gestation where labor really commenced at the average period, but, owing to impeding causes, ceased without producing the birth of the child, and recurred a good while thereafter with better results. In some of

these cases the labor was postponed exactly a month, thus strengthening the theory held by many obstetricians that parturition is influenced by what would be the menstrual periods if pregnancy did not exist.

Recent Labor.—As the physician is liable at any time to be called upon in the halls of justice to testify in cases involving the question as to whether or not labor, or childbirth, has taken place, I shall endeavor to epitomize a few of the signs of recent delivery. In the majority of these cases it will not do to place much reliance upon the statements of the woman herself, as she is an interested party whose veracity and judgment are apt to be warped by her relations to the case. It therefore becomes necessary for the practitioner to avail himself of all the means of diagnosis at his command, more particularly of a physical examination, which should be made before the expiration of twelve days after delivery, to enable him to form a correct decision.

During the first few days subsequent to labor the mammæ will be found enlarged, swollen, and perhaps full of milk, which should be subjected to a microscopic examination, and if found to contain colostrum corpuscles the proof of recent labor is conclusive. The absence of milk, on the other hand, is not of itself sufficient evidence to cause us to come to an opposite conclusion; because it is by no means uncommon for the secretion of milk to cease very soon in women who do not nurse. If, in addition to the above symptoms, the areolæ around the nipples should be enlarged and darkened, the abdomen loose and flabby, and marked at various places with white streaks, the labia swollen, the vagina swollen and dilated, the cervix uteri open and hanging loosely in the vagina, the lochia be present, and the womb be found enlarged and above the brim of the pelvis, with its cavity larger and especially much longer than in the normal unimpregnated state, we would have, if possible, still stronger proof of recent delivery. Even in the absence of milk in the breasts, a combination of the latter symptoms ought generally to be considered sufficient evidence of the same fact.

We would, of course, not expect to find the uterus in the hypogastric region after a week or ten days, but in the true pelvis. Neither would we at that period anticipate finding the vagina and cervix very different from the normal condition. The cavity of the uterus would, however, be still more capacious than in the

natural unimpregnated condition. We would, of course, be extremely careful in the use of the sound during the period of uterine involution.

How to Make a Vaginal Examination.—As a vaginal examination is often necessary not only in the diagnosis of pregnancy, but for the purpose of gaining information either of a negative or positive character in all its stages, and particularly towards its termination, the student should seek every convenient opportunity of learning how to make it.

Theoretically it is the simplest thing in the world, but practically it is sometimes very difficult to the novice. I am of course alluding to what the French term the *toucher* or digital examination of the vagina, as the examination by specula and other instruments comes more within the province of the gynæcologist than the obstetrician.

It requires much tact to conduct this examination in a profitable manner without shocking the sensibility of your patient. The young and inexperienced practitioner will often feel himself much embarrassed in making the first few experiments in this line.

It is, I am sure, unnecessary for me to remind him that his patient is entitled to be treated with the utmost refinement and delicacy, and that there should never be any undue exposure of her person—in fact the examination should always be made under the clothes, without any exposure whatever of the patient. In this particular it of course differs greatly from speculum examinations, which are used chiefly in pathological conditions of the female sexual organs. It is important to learn how to use either hand, as it is not always convenient for the patient to be placed in a suitable position for only one hand. The index finger is generally used, although there are cases requiring the use of both this and the middle finger, especially where the os tincæ is very high up, or the former finger is very short. In fact, if the obstetrician's finger were four instead of three inches long he could make the examination with much more accuracy, and with far less discomfort to his patient. I sometimes think that a man with a large hand and stubby fingers should be debarred from the practice of obstetrics.

With his coat and shirt sleeves turned over at the wrist, and a napkin surrounding the forearm, the physician should carry his finger, previously covered with warm sweet oil, lard, vaseline, or

cosmoline, forward over the perinæum and the posterior commissure of the vagina, and with the radial border looking towards the symphysis pubis, gently insert it between the labia and into the vaginal canal. It seems hardly necessary to caution him not to pass his finger into the wrong canal, but such blunders have actually occurred, much to the annoyance of the patient and the mortification of the tyro in midwifery.

An examination per anum may however occasionally be necessary in obstetrical practice, and is often so in the investigation of diseases of the uterus and appendices. We avail ourselves, for instance, of this method of examination in pregnancy complicated with tumors, in cases of partial atresia, or of excessive tenderness of the parts, and in some cases where it is desirable during the first two months of gestation to ascertain whether the uterus is enlarged.

Within the last few years it has become customary, in certain pathological conditions of the pelvic organs of females, for gynæcologists to introduce the whole hand into the rectum. Since this practice has been in vogue I have read of several instances of rupture of the sphincter ani and of the rectum itself. Although the practice is justifiable under certain circumstances if the operator's hand be small, it should never be undertaken by one with a very large hand.

It would be tedious to enumerate all the circumstances requiring an examination per vaginam. It is demanded most frequently at the beginning of and during parturition, with the view of ascertaining whether labor has actually commenced, to note its progress, and to ascertain the presentation and position of the fœtus. It is often necessary in forming a diagnosis of pregnancy. In the latter instance care should be observed that an abortion or premature labor be not produced by a rude and careless pressure against the os and cervix uteri. It is often necessary, in order to conveniently reach the latter parts of the womb, or the body itself of this organ, to use what some authors are pleased to designate as conjoined manipulation—that is, the womb should be pressed down against the examining finger of one hand by the other hand being placed over the lower part of the abdomen. In some cases where it is extremely difficult to reach the cervix or os uteri, it may be well to take advantage of gravitation and examine the woman in the erect position, when these parts will the more readily be reached.

By the vaginal examination the experienced obstetrician may ascertain the state of the perineum, labia, and vaginal canal, the dimensions of the pelvic basin, especially in reference to deformities, and as to whether or not the rectum is distended with fæces.

I have often witnessed the good results of a careful examination per vaginam, of the condition of the lower bowels, but I have never been more forcibly impressed upon this point than in a case lately coming under my observation. Being called to a lady in her first confinement, I was told by the midwife in attendance that there was "no room for the birth of the child, as the birth-place had almost grown up." I found considerable difficulty in inserting my finger into the vagina. Not for the reason assigned by the midwife, but because of the enormous quantity of fæces impacted in the rectum. Before withdrawing my finger from the vagina I broke up this accumulation by pressure through the recto-vaginal parietes, and then removed it by successive enemas of warm soapsuds. Had this large mass of hardened fecal matter been allowed to remain, I have no doubt but it would have seriously retarded parturition.

PLURAL PREGNANCY.—This includes all those cases of pregnancy where there are two or more fœtuses within the uterus. It is by no means uncommon for a woman to bring forth twin children. This occurs about once in eighty-seven labors. But triplets are far more rare, the average being once in about 7700. There have been instances of four children at a birth, and a few of early abortion, where there were even five fœtuses. It is also recorded that there have been as many as seven or eight at a single time; but we cannot place much reliance upon such statements. Could the great showman, Barnum, secure such a case for exhibition, he would realize more money than he has ever amassed from pigmies, giants, and mermaids.

Plural pregnancy is greatly influenced by races and countries, and seems to be most frequent where the general fecundity of the inhabitants is the greatest.

In point of frequency of multiple pregnancy, Russia bears the palm. It will be found that the relative proportion of triplets is greatest where twin births most abound.

It has been shown by statistical observations that, with the exception of the first pregnancy, the tendency to plural births is greater in each succeeding pregnancy and as the woman advances

in age. Other things being equal, a female is more apt to have twins at her first parturition than afterwards.

There is also a strong hereditary tendency in many persons towards the production of multiple births. Simpson, in his obstetric works, makes mention of a woman who had one female and three males at a birth, who survived; and that the former, the daughter, subsequently bore three children at one time.

Combined Intra-uterine and Abdominal Twin Pregnancy.—There are cases of twin pregnancy with one child in the uterus and the other in the abdomen. Without inquiring into the literature of the subject, I shall only state that the examples are few, and refer the reader to the case of Dr. E. P. Sale, of Mississippi, published in the New Orleans *Medical and Surgical Journal* for October, 1870; and to the more recent one of Dr. H. P. C. Wilson, of Baltimore, Maryland, to be found in the *American Journal of Obstetrics* for October, 1880. In the former case both children were removed alive through the abdomen; in the latter instance one fœtus was normally expelled at eight months' gestation from the uterus, and the abdominal one removed alive by laparotomy at term, twenty-six days after the first child was born The last operation was performed on the 11th of May, 1880, by Dr. Wilson. The patient survived four days. The child was alive and healthy three months after the operation. The one that was born naturally, died within a month of its birth from the want of good nursing. In Dr. Sale's case the mother died about four days after the operation; but both children survived.

Causes of Plural Pregnancy.—It is an unsettled question whether plural pregnancies are to be ascribed to separate acts of insemination following each other in quick succession, or to the simultaneous fecundation of all the ova in any particular pregnancy.

Instances of the birth of twins of different colors have been observed, especially in the southern part of the United States, which indicate that successive acts of coition within a short time may result in the impregnation of distinct ova. While it may be admitted that such is often the case, it by no means follows that it is always, or even generally, so. The fact seems to be that plural pregnancies sometimes result in this way, and occasionally from single acts of insemination. It is easy to comprehend that where there are two or more mature ova ready for vitalization,

that the spermatozoa from a single coition may impregnate only one, or all of them, but not necessarily any of them. And so when an ovum has two yelks, both the latter may become impregnated at the same time. A Graafian follicle occasionally contains several ovules, which may be fertilized simultaneously or otherwise. More will be said upon this point when we discuss the kindred subjects of *superfecundation* and *superfœtation*. There is considerable variation in the form and connection of the placenta and membranes in twin pregnancy. In many cases we find two distinct placentæ and two bags of water, the septum between the latter consisting of four layers—the amnion and chorion of each ovum, the deciduous membrane originally forming a part of the septum having been absorbed. In such cases we know that the twins cannot be developed from a double yelk, but from distinct ova. But there are cases where the blending of the placentæ and membranes of the two embryo is so intimate as to indicate distinctly that they must have sprung up from a double yelk, and not from separate ovules. As for instance, where there is only one chorion containing two distinct amnions with an embryo in each, or where both fœtuses are contained within a common amniotic sac. It is very difficult to account for the latter condition, except upon the theory of the two layers of the amnion, primarily constituting the septum, disappearing from absorption caused by pressure.

In the instances of one chorion containing two amnions, or of two fœtuses lying in a common amnion, the placentæ are in such close apposition as to appear almost like a single placenta, and the umbilical cords, although separately attached to each fœtus, sometimes unite before entering the placental tissues.

In triplicates we may find the placentæ and membranes separate, but usually there is one perfect and another imperfect membranous bag, the former being composed of a chorion and an amnion, while the latter has within a common chorion a double amnion. It might thus be inferred that triplicates are commonly developed from two ova, one of which contained a double yelk.

Sex.—As regards sex we find a male and a female the most common in twin pregnancy, next, two females. The most uncommon of all are twin males.

Weight.—As a general rule the fœtuses of twin pregnancies are smaller than the child of a single birth. They are still smaller

in cases of triplets and quadruplets. There is also a tendency to premature delivery in proportion to the number of children in the womb at one time. The mortality is of course greater in multiple than in single pregnancy, and bears a ratio to the number of fœtuses. In twins it is about one in thirteen, in triplets it is rare for all the children to survive, and in quadruplets, premature labor of stillborn fœtuses is almost the universal rule.

Unequal Development of Fœtuses in Plural Pregnancy.—In all the varieties of plural pregnancy the fœtuses may be unequally developed. This has been particularly noticeable in the cases of twins, where one fœtus may be perfectly developed and healthy, and the other undeveloped, weakly, and sometimes deformed, and occasionally dead. In other instances, both children may be fully developed and healthy at birth, but one much larger than the other. This difference between the fœtuses is ascribed by some authors to superfœtation. It is, however, probably true that in the majority of such cases the development of one fœtus has been partly arrested or interfered with by accidental circumstances, such as the pressure of one child upon the other, or upon the umbilical cord of the other, or to some original defect in one fœtus, its cord, or placenta.

Labor in Plural Pregnancies.—Although the children in multiple pregnancies are generally born within a few minutes or a few hours of each other, there are numerous exceptions. Sometimes several days, or weeks, or months, may intervene between the births—particularly in the case of twins. In instances where the interval between the births is very long, it is usually found that one of the fœtuses has been thrown off in a state of immaturity or death, while the other has been retained until fully developed. When one of the twins dies in utero, it may be thrown off separately, or may excite premature labor, and both it and the live one be expelled; or it may become hard, withered, and mummified, and be retained in utero until the full time, and then expelled with the living one; or the latter may be born either prematurely or at the full term, and the former be retained for a considerable period.

Diagnosis of Plural or Multiple Pregnancy.—Although it be of but little practical value to know prior to parturition whether the woman is pregnant with more than one fœtus, yet it may be worth while to state a few of the symptoms or signs of twin preg-

nancy upon which a moderate reliance may be placed. I shall, however, admit beforehand, that in the majority of cases it is impossible to diagnose any form of plural pregnancy before the birth of one of the children.

The most reliable sign of twin pregnancy is the pulsation of two fœtal hearts. The presence or absence of this must be determined by careful auscultation. As in twin pregnancy one child generally lies on the right and the other on the left in the womb, (Fig. 56), it is sometimes possible to diagnose twin pregnancy by ascertaining that there is a site on each side of the abdomen where the fœtal pulsations are stronger than at any intermediate point. This diagnosis is rendered more certain if there be a difference of frequency and synchronism between the pulsations,

FIG. 56.

(Cazeaux.)

provided the sounds of the maternal arteries be eliminated. If, on the contrary, the pulsations instead of becoming fainter from the two lateral points, towards the centre grow stronger, the diagnosis would exclude twin, in favor of a single pregnancy. Twin pregnancy, however, may be present without our being able to detect both pulsations, where, for example, one child occupies a dorso-posterior position, when the transmission of the sound may be prevented by the body of the other fœtus.

I may add that in plural pregnancy there is generally an unusual enlargement of the womb, and more or less irregularity in its shape. It may, for instance, be large on each side and depressed in the middle. The woman may feel movements in dif-

ferent parts of the womb, or they may be felt by the obstetrician himself if the abdominal walls are very thin and relaxed. All the signs, except perhaps pulsations of the two fœtal hearts, are generally more or less uncertain and fallacious.

SUPERFECUNDATION AND SUPERFŒTATION.—There has been much confusion in the meaning of these terms as used by different authors. The older writers embraced in the definition of *superfœtation* all cases of conception occurring while the woman was already pregnant. It is commencing to be the custom of modern authors to use the word *superfecundation* for all cases of pregnancy occurring prior to the union or close apposition of the decidua reflexa and decidua vera in a woman already pregnant. This blending of the two portions of the deciduous membrane generally takes place during the third, though sometimes as early as the end of the second month of gestation They restrict the definition of *superfœtation* to a conception taking place after this membranous union is effected in a pregnant woman. Therefore many of the cases cited by the older authors in proof of superfœtation can only, under this meaning of the word, be applied to cases of superfecundation. Such, for example, as that of a sexual congress of a black and a white man within a short period of each other with a black woman, who in due course of time gives birth to a negro and a mulatto child, of which there are many cases

A still more surprising example is reported by Dr. Henry, of Brazil, South America, of an Indian woman giving birth, within short periods of each other, of an *Indian*, a *European*, and an *African child*, as the result of cohabitation at short intervals with men of different races.

Other examples of superfecundation are where a woman is delivered of a fully developed child, and in from one to eight, or probably ten weeks thereafter, gives birth to another of about equal size and development; or, of a woman who gives birth at the same time to two unequally developed children.

If the intervals in the first case, however, should be about three or four months, or the difference in size and development in the second case be so great as to indicate a difference of over three months in the respective ages of the two children, the cases must come under the head of superfœtation, unless otherwise explained.

The opponents of the theories of superfecundation and superfœtation claim that the examples first given are only cases of

twin pregnancy, and the first class of cases, as just described, or those of equally developed children being born at a few weeks' or months' interval of each other, can be accounted for upon the theory of there having been a conception at different times in the two divisions of a bi-lobed or double uterus, each division expelling its contents at different periods, or as soon as the fœtus therein is matured. This, however, is considered by some authors as a kind of superfecundation or superfœtation, but is not generally so called.

The explanation given of the second class of cases, or those of unequal size and development being born at the same time is, that it is only an ordinary twin pregnancy, where one of the fœtuses, owing to pressure upon its cord or some other unfavorable condition not applying to the other child, fails to be developed like its companion.

Besides claiming the ability to account for these supposed cases of superfecundation and superfœtation, they assert that these conditions are anatomically and physiologically impossible, and specify as reasons for their objections that the deciduous membrane so completely closes the three openings into the cavity of the pregnant womb,—the internal os uteri and the mouths of the Fallopian tubes,—that a passage of the spermatozoa is impossible. Believing in the Hunterian theory of the formation of the decidua, they formerly applied this objection to all cases of supposed superfœtation after about the second day of pregnancy, but since it has been proved that the decidua is not formed as Hunter asserted, and that until the union of the decidua reflexa and the decidua vera, at from eight to eleven weeks after conception, no obstacle to the free passage of the spermatozoa upwards or of the descent of the ovum exists, as can be seen in Fig. 57, after Coste, the objection has lost its force against all those cases now included under the head of *superfecundation*, but is still applicable, so far as it has any force, to cases of true *superfœtation*, as at present defined.

A second objection urged against both superfecundation and superfœtation is, that the mucous plug filling the cervix uteri after conception, forms a barrier against the entrance of the spermatozoa into the cavity of the uterus. It has been demonstrated that such is not the case, and that the plug of mucus is no greater obstacle after than prior to conception. A third objection against

both conditions is that during gestation ovulation is suspended. But if we are to consider menstruation as a sign of this important physiological function, we know that is in abeyance as a rule only, and that the exceptions, where menstruation occurs during pregnancy, especially during the first two or three months, or until the union of the decidua reflexa and decidua vera, are sufficient to allow quite a number of secondary conceptions.

In consequence of the new light upon the subject, particularly as regards the want of any obstacle to the passage of the spermatozoa by the decidua until the period of its two layers coming in

FIG. 57.

Illustrating the Cavity between the Decidua vera and the Decidua reflexa during the early months of Pregnancy. (After Coste.)

contact, most physiologists of the present day give their sanction to the theory of superfecundation, but the majority deny the possibility of superfœtation. We shall, however, give a few of the examples adduced in support of the latter. They are, of course, similar to numerous cases that are usually quoted in favor of superfecundation, but differ only in the fact that the interval between the first and supposed second impregnation is too great for superfecundation.

The following case is reported by Dr. Tyler Smith: "A young married woman, pregnant for the first time, miscarried at the end

of the fifth month, and some hours afterwards a small clot was discharged, inclosing a perfectly healthy ovum of about one month."

Dr. Bonnar, of Cupar-Fife, reports in the *Edinburgh Medical Journal* for January, 1865, some very interesting cases of supposed superfœtation, taken from a register of the peerage, where there could be no mistake as to exact dates of births. The respective intervals between the birth of the first and second child in each of three cases mentioned by him was 182, 174, and 127 days. Nothing could be definitely known, in these cases of Doctors Smith and Bonnar, as to whether the mothers had double wombs or not.

The following case, however, mentioned by Professor Hodge, seems to be inexplicable upon any other theory than superfœtation: "A lady of Strasburg was delivered, on the 30th of April, of a lively child; on the 17th of September of the same year (that is, one hundred and forty days after the first delivery) she brought forth a second apparently mature and healthy child. She subsequently bore children, and at her death her uterus was found single."

Can Superfœtation occur in Extra-uterine Pregnancy?—Allusion has already been made to the general belief among physiologists that impregnation may take place in the cavity of the uterus while extra-uterine pregnancy is present. Dr. Parry, the late able editor of Leishman's Midwifery, believed this to be unproved, so far as it relates to the second pregnancy occurring prior to the termination of the pseudo puerperal condition following the death and false labor of the extra-uterine fœtus. Yet, in the very next paragraph of Leishman, following his objection, is a statement of a case that appears to be in direct opposition to his views; in truth, is so, unless it should appear that the extra-uterine fœtus had perished about three months before the mother, of which there is no intimation. The case is recorded by M. Cliét, of Lyons. He states that a woman died suddenly, and upon dissection an extra-uterine fœtus of five months was found in the abdomen, while a fœtus of three months occupied the uterus.

CHAPTER XII.

EXTRA-UTERINE PREGNANCY.

THE term extra-uterine pregnancy embraces all forms of gestation outside of the cavity of the uterus, which is the normal site specially prepared by nature for the development of the fecundated ovum. The latter may be arrested and developed in the ovary itself, in any part of the Fallopian tubes, or may fall into the abdominal cavity, or in a hernial sac. As the varieties are named after the various sites of development, it is possible to make a great many of them. Such as ovarian, tubo-ovarian, tubo-abdominal, utero-tubal, utero-tubo-abdominal, tubal, interstitial, primary and secondary abdominal, hernial, etc.

For the sake of convenience I shall describe the forms of extra-uterine pregnancy under four headings:

First. Tubal Pregnancy.

Second. Interstitial Pregnancy.

Third. Abdominal Pregnancy—Primary and secondary.

Fourth. Ovarian Pregnancy.

TUBAL PREGNANCY (Fig. 58).—This variety is by far the most common form of extra-uterine fœtation. Owing to certain con-

FIG. 58.

Case of Tubal Gestation (after Maygrier).

ditions or causes, to be mentioned under the head of Etiology, the fecundated ovum in its passage from the ovary towards the uterine cavity becomes arrested in some part of the Fallopian tube, and there contracts adhesions, and undergoes those marvellous

changes already described as taking place when it reaches the uterine cavity. The embryo, with its membranes and placenta, is developed within the ovum in the same manner as would be the case were the latter in its normal *nidus*, the cavity of the womb.

However, the rupture of the sac surrounding the ovum generally occurs too soon for the full development of the placenta. This sac is formed from the part of the stretched and hypertropied walls of the Fallopian tube in which the ovum is lodged. The mucous membrane of the tube is converted into a kind of decidua, which, although analogous, is not precisely like the deciduous membrane of the womb, there being no true decidua reflexa, besides other slight differences.

In all forms of extra-uterine pregnancy, a decidua is formed in the uterine cavity, but is a much more ephemeral structure than that developed when the ovum is normally lodged in its protecting folds. In fact, it is generally detached and expelled so early that many pathologists, from not having been able to see it in post-mortem examinations, have doubted its existence. It is, by some authorities, believed to be gradually washed away by the irregular hemorrhages that occur after the first six or eight weeks of tubal pregnancy.

The distension of the Fallopian tube becomes so great as the size of the ovum increases, that its muscular fibres separate from each other at places, leaving the protruding embryo covered only by its attenuated peritoneal and mucous coats. The expansion of the tube continues in proportion to the growth of the embryo, until it becomes ruptured; which event is sure to take place sooner or later, and generally prior to the expiration of the third month of gestation. The period of rupture depends a great deal upon the site of the ovum. When the latter occupies chiefly the fimbrinated extremity, there is more room for its expansion than in other parts of the tube; and, consequently, rupture may not occur for eight or nine months.

The unoccupied portion of the tube on each side of the embryo, usually becomes so altered by stretching that its canal cannot be recognized, though it may remain unaltered.

2. Interstitial Pregnancy.—In this, the rarest form of extra-uterine pregnancy, the ovum is lodged in that part of the Fallopian tube traversing the walls of the uterus, and forms a nidus in the latter, where it may grow until the full period of utero-gestation,

though it generally bursts its sac much earlier. In some of the cases the placenta develops in its normal situation,—the uterine cavity.

3. Abdominal Pregnancy.—In this division of extra-uterine fœtation the ovum is lodged and developed in a portion of the abdominal cavity (Fig. 59). Some authors make two varieties of abdominal pregnancy, depending upon whether the ovum commenced its development primarily in this cavity, or reached a certain degree of growth elsewhere, as, for example, in the Fallopian tube, and after a short period bursting its sac and finding a new lodgment in the cavity of the abdomen.

Barnes is inclined to think that abdominal pregnancy is never primary, and founds his belief upon the difficulty of understanding how so minute a body as the ovum can possibly fix itself on so

Fig. 59.

Case of Abdominal Pregnancy.

smooth a surface as that of the peritoneum. Other authors can see no more difficulty in the ovum thus fixing itself at the very first stage of its development than at the later period.

It is, therefore, probably true, as is generally believed, that the impregnated ovule, escaping the grasp of the fimbriated extremity of the Fallopian tube, falls into the cavity of the abdomen, and attaching itself to the peritoneum, becomes developed.

When we look at the mechanism adapted by nature for seizing the ovum and conveying it to the womb, there to be developed if fecundated, or allowed to pass off with the secretions if otherwise,

we cannot but wonder that abdominal pregnancy is so rare as it is, for it seems almost certain that a good many ovules must escape the grasp of the fimbriated extremities of the tubes.

I have stated that the ovum is fecundated before falling into the abdomen in cases giving rise to pregnancy in that cavity, but some authors maintain that, though this is the almost universal rule, yet the ovule may be impregnated in rare instances by the spermatozoa finding their way into the cavity of the abdomen, and there coming in contact with, and fertilizing an ovum, which has escaped the grasp of the Fallopian tube. There is at least one example of such a result on record. Allusion is made to a case reported by Koeberlé.

The ovum may become fixed and developed on the peritoneal surface of any of the abdominal viscera. In the course of its growth much irritation takes place in the surrounding tissues, and an exudation of plastic material is formed around it, resulting in the creation of a secondary cyst or sac, in which bloodvessels from the mother become developed. This sac is hardly ever absent, yet it presents every degree of development, from a thin flimsy covering to one possessing thickness and great strength.

The sac in abdominal pregnancy being generally strong, and there being ample space for the growth of the embryo, it is not ruptured so early as in the other forms of extra-uterine pregnancy. The development, in most cases, goes on without any very serious symptoms, until the expiration of the usual term of gestation, though laceration of the sac may occur earlier, attended with severe hemorrhage into the abdominal cavity, and symptoms of collapse, which sometimes proves fatal. If death to the mother does not occur, but she should rally, the now dead fœtus will give rise to phenomena of a variable character, but all tending, with rare exceptions, to fatal results. This part of the subject will be more fully discussed in connection with similar phases in the other divisions of extra-uterine pregnancy.

4. Ovarian Pregnancy.—It is a question of controversy whether this species of extra-uterine pregnancy be really possible. The answer must of course depend in a measure upon what is meant by the term. If this be restricted as meaning pregnancy in an unruptured Graafian follicle, it must stand unproved as yet, for a true example of this nature has probably never been observed. Pregnancy of this kind would necessarily imply the capability of

spermatozoa penetrating an unlacerated Graafian follicle so as to reach the ovum. Coste asserts his belief of this occurrence, but he is not sustained by other observers. Spermatozoa have been found on the ovary, but never within, unless the latter be lacerated. Although it be doubtful whether ovarian pregnancy in this limited sense ever does occur, it is certain that it does in its more extended meaning, denoting pregnancy of an ovule in close connection with the ovary, or of one within a lacerated Graafian follicle. It is very easy to understand how an ovum could be fertilized by coming in contact with a spermatozoon under the latter circumstances. For although laceration of the follicle may have occurred, the ovum may not only retain its place until impregnated, but for a considerable period afterwards.

ETIOLOGY.—The causes of extra-uterine pregnancy are enveloped in much obscurity. There are many theories offered in explanation of the subject. The perturbating effects upon the Fallopian tubes, supposed to be produced by the strong emotions, especially fear, either during coition or shortly afterwards, have been assigned a prominent place in the list of causes, but the majority of modern observers are disposed to ignore them altogether.

In a general way it may be stated that anything that prevents the ovum from reaching its normal site for development—the cavity of the uterus—and yet does not debar the movements of the spermatozoa so as to vitalize the ovum, should be looked upon as a cause. Hence all forms of pathological conditions of an ovary or a Fallopian tube may act as causes either by deranging the functions of the fimbriated extremity for seizing the fecundated ovum when discharged from the Graafian follicle, and thereby permitting it to fall into the abdominal cavity, and under favorable conditions to produce abdominal pregnancy; or by thickening of the mucous membrane of the tube and consequently lessening its cavity, or by the formation of small *polypi* on the same and thus obstructing it, or by the formation of external adhesions and tumors which may cramp or exercise undue pressure upon its calibre, and thus produce tubal pregnancy.

In relation to the causes of ovarian pregnancy, if it be impossible for the spermatozoa to penetrate through the external tunics of the ovary and Graafian follicle, as contended by some authors, it may be considered highly probable that the ovum was vitalized

just after the rupture and before the discharge could have occurred, and then remained and became developed in the ovary itself.

If Koeberle's case be authentic in all its essential points, it would seem that the entire uterus, with the exception of a part of the neck, may be removed, and yet abdominal pregnancy occur, provided the ovaries are left in their proper sites. In his case it appears that there was a fistulous opening in the part of the cervix remaining, leading to the abdominal cavity, through which the spermatozoa passed and vivified an ovum which had already fallen into the abdomen. But even when the whole utero-Fallopian canal is in perfect order it is very easy to account for abdominal fœtation upon the supposition that the fimbriated extremity of a Fallopian tube does not always succeed in seizing an ovum, whether

FIG. 60.

Tubal Pregnancy, with the Corpus Luteum on the opposite side. The Decidua is in process of detachment from the Uterine Cavity. (After Tyler Smith.)

fecundated or not, in order to direct its passage to the uterine cavity. It is doubtless a fact that a great many ova thus fail in being conducted along their natural channel, and consequently fall into the abdominal cavity. It by no means follows that all the impregnated ova implant themselves upon the smooth peritoneal surface for future development. It is most probable that a very small proportion of them thus succeed.

The ovum would seem to be at times very wandering in its course, as cases are on record showing a tubal pregnancy, with the corpus-luteum in the ovary of the opposite side (Fig. 60). Dr. Oldham has recorded several cases of this kind. These whimsical phenomena in extra-uterine pregnancy have given rise to much discussion. No one appears to doubt that in these examples the

ovum absolutely passed in some way from the ovary of one side to the Fallopian tube of the opposite side. But how did it do it? Was it seized by the fimbriated extremity of the opposite Fallopian tube? Or did it, after having reached the uterus, pass up the opposite tube by an anti-peristaltic action of the same, or by the influence of ciliary currents moving in an upward course? Mr. Wharton Jones would answer the first, and Dr. Tyler Smith the second question, in the affirmative. There are other theoretical explanations offered in regard to the origin of this curious form of extra-uterine pregnancy, but none of them appear so plausible as the two just mentioned.

Progress and Symptoms of Extra-uterine Pregnancy.—Although extra-uterine fœtation is very rare, its symptoms somewhat obscure, and its treatment too often ineffective, yet it is essential that the physician should understand the chief points in relation to it, and especially its symptoms, that he may be prepared to afford at least some assistance to his most unfortunate patient.

The development of the fœtus in all forms of extra-uterine pregnancy progresses in a very similar manner to what it does in normal or uterine pregnancy. The ovum possesses its own membranes, the amnion and chorion, which are essential to its development, although some authors would have us believe that there is no chorion in abdominal pregnancies. But while the two fœtal membranes just mentioned are present in all forms of extra-uterine pregnancy, the maternal covering corresponding to the decidua of true pregnancy presents itself under such diverse modifications in the different varieties as to be hardly recognized as one and the same kind of structure.

In fact it is very doubtful, with the exception of tubal pregnancy, whether anything analogous to the decidua is formed. There is, however, in all varieties of extra-uterine pregnancy, with the possible exception of the abdominal in its early stage, a sac or covering external to the fœtal membranes. This is composed differently in the several varieties, depending mainly upon the location of the pregnancy.

In tubal pregnancy the sac consists of the mucous, muscular, and peritoneal coats of the latter; in ovarian pregnancy, occurring without a primary laceration of the Graafian follicle, if such be possible, it must consist at first of the walls of this follicle surrounded by the coverings of the ovary itself.

It is the belief of Playfair and other authors, that a sac is generally formed around the special covering of the ovum—the amnion and chorion—in cases of primary abdominal pregnancy. Leishman and a few others either deny the possibility of such an occurrence or look upon it as very doubtful. The former party believe that the sac is formed from coagulable lymph exudated from the peritoneum at the site of the ovum; the latter declare that no such exudation occurs, because the ovum is at first too small and light to excite its production.

Nearly all authorities, however, agree that a sac is generally formed around the embryo when it falls into the abdominal cavity after rupture of either the membranes, or the latter with the special sac, when there is one; whether the rupture occurs in the Fallopian tube, the ovary, the walls of the uterus, or the horn of a bi-lobed womb; yet Dr. Rogers, of New York, and some others, are skeptical even upon this point. It matters but little where the fertilized ovum may graft itself, it soon begins a course of development, which, if the site be anywhere except the cavity of the womb, must, with rare exceptions, end in rupture of its coverings, and ultimately death of itself and the mother.

Rupture generally occurs much earlier in the different varieties of tubal than in abdominal pregnancy. It has already been stated that a placenta is formed in extra-uterine pregnancy, if its development be not prevented by a too early rupture of the fœtal sac, and the uterus, though empty, assumes changes more or less marked, similar to those which occur in regular pregnancy prior to the descent of the ovum into its cavity. In truth, it is partly owing to these changes in the womb, especially a slight increase in its size and a softening of its neck, which helps to render the symptoms of extra-uterine pregnancy more obscure than they otherwise would be in the early stages.

In brief, it may be stated that the changes occurring in the uterus, and sympathetic phenomena taking place in the stomach and breasts, simulate true pregnancy so closely for the first two months that a differential diagnosis is generally impossible. We can place no reliance on the absence of menstruation, as this is as often present as absent in extra-uterine pregnancy. As abdominal pain, from an early period, is a very common symptom, it will, in some cases, lead us to suspect the nature of the pregnancy, especially if we eliminate true pregnancy by the use of the uterine

probe. But, if we are not careful in the use of this instrument, we may eliminate it in the wrong way; that is, we shall find out, when too late, that we have ruptured the membranes of a true pregnancy, and produced an abortion. For a probe inserted into the pregnant womb is almost sure to lead to such a result. In the differential diagnosis a little reliance may be placed upon the womb being more irregular, and being situated more on one side than in true pregnancy.

Of course, quickening and pulsation of the fœtal heart occur after the third or fifth month in both forms of pregnancy.

The abdominal pain, already alluded to, is looked upon by some authors as a very valuable symptom in the diagnosis, especially if it be marked, and recur at intervals, and be accompanied by metrorrhagia. They also lay stress upon the fact that the uterus is not developed in extra-uterine pregnancy in proportion to the duration of the pregnancy, and that its os is mostly carried forwards and upwards, so as to press against the symphysis pubis, while an elastic or fluctuating tumor may be detected in the pelvis posterior to the uterus.

Although the symptoms of extra-uterine pregnancy are obscure, and, in many cases, not even very distressing until rupture of the sac occurs, they then present a very grave aspect. The patient will then be found with a small, thready, almost imperceptible pulse, and may, perhaps, be vomiting. Her intellect will, however, be clear, and she will tell you, if asked, that she has just had a terrific pain in the abdomen. If the internal hemorrhage, which always accompanies rupture, be great, the patient will die without reaction taking place. Sometimes, however, she rallies, to be carried off by a recurrence of the hemorrhage.

Rupture occurs much earlier in tubal than in abdominal pregnancy. In the former it nearly always takes place between the fourth and the twelfth week of gestation, though a few cases are on record of its postponement to a later period, even to the full term. In abdominal pregnancy it usually happens about the eighth or commencement of the ninth month, although it is very frequently held in abeyance until the full period of gestation.

Where rupture does not take place until the full period of gestation, labor pains set in, and, after continuing for a few hours or days, gradually subside, without, of course, effecting anything towards the expulsion of the fœtus; but they often result in rupture

of the sac, when the mother almost invariably dies from the shock produced by the hemorrhage, and, perhaps, pain.

The fœtus generally dies during this pseudo-labor, but may not do so for two or three months thereafter. This false parturient condition is accompanied by expulsion of any part of the decidua still remaining in the cavity of the womb; occasionally, too, with a slight uterine hemorrhage.

Sometimes milk may be found in the breasts. Rupture is not an invariable result of extra-uterine pregnancy. It, however, probably takes place in seven-eighths of all cases. The student may very naturally inquire what it is that becomes ruptured. In the different varieties of tubal pregnancy it is the fœtal membranes and the sac. In abdominal pregnancy it is sometimes the membranes solely, for the simple reason that occasionally there is no sac to be ruptured.

The hemorrhage succeeding the rupture of the sac or fœtal membranes, in all forms of uterine pregnancy, may be so great as to carry off the patient in a few minutes or hours; or, it may recur again and again, and still not prove fatal for several days. If the patient survives the shock, and anæmia from the loss of blood, the succeeding peritonitis nearly always ends in death. Should the result not be so serious, a sac is commonly formed, as stated, from the effused coagulable lymph, and the fœtus is thus shut out from the remainder of the cavity of the abdomen. A process of gradual disintegration of the contents of the sac next follows in the majority of instances. In course of time, inflammation of the sac and contiguous structures occurs, and consequent adhesion to the latter. Then ulcerative absorption succeeds, terminating in fistulous openings in various directions. These fistulæ sometimes open into the hollow viscera of the abdomen, and at other times extend through the walls of the abdomen. Hence, portions of the least destructible structures of the disintegrated fœtus, such as bones, etc., may be discharged for months or years subsequently through the bladder, rectum, vagina, stomach, or abdominal wall. Of course, a symptomatic or irritative fever, of a moderate or severe grade, is induced by these pathological changes.

In the few instances where rupture of the membranes or sac does not occur in extra-uterine pregnancy, it is probable that death of the fœtus or the mother takes place before there is much distension of these structures. The mother may die at this early

period from pain and functional disturbances produced by pressure of the fœtal tumor upon neighboring organs.

In those cases where rupture does not occur, because of the early death of the fœtus, the latter may remain for a long time, even years, without seriously impairing the mother's health; but it will probably be ultimately disintegrated and extruded by similar changes, and through like channels, as in the cases first-mentioned.

In those examples where the dead fœtus has been retained in the cavity of the abdomen for many years, without giving rise to alarming symptoms, it generally becomes more or less withered or mummified, or changed into a substance analogous to *adipocere*.

There are a few remarkable instances on record of the sac of a long-retained fœtus being the seat of calcareous deposits. Under such circumstances a fœtus has been known to be retained for a period of twenty years or more, the woman, in the meantime, becoming repeatedly pregnant and giving birth to healthy children.

TREATMENT.—This depends upon the variety of extra-uterine pregnancy, and upon its different stages, and is, for obvious reasons, uncertain and commonly only palliative, especially in the early stages. Of course anodynes are requisite before and after, and particularly immediately subsequent to, rupture; and so are the various hemostatic measures during the period of hemorrhage. Where tubal pregnancy can be positively diagnosed excision through the abdominal walls of that portion of the tube containing it prior to the period of rupture would seem to be good practice, or else an opening of the cyst through the vagina and extraction of the fœtus. Dr. T. G. Thomas, of New York, has proved that the latter may be done successfully by a platinum knife rendered incandescent by a galvano-caustic battery. He, however, came near losing his first patient from hemorrhage, caused by attempting to extract the placenta, which it is safer to let alone, unless it can be detached quite easily, and to trust to the drainage of the cyst and the injection of antiseptics, as means preventive of serious consequences from such retention. This rule in regard to the placenta holds good in gastrotomy for abdominal pregnancy.

I find it stated by Dr. Robert P. Harris, of Philadelphia, that in a successful operation for secondary abdominal pregnancy performed by Dr. Thomas, May 10th, 1876, he made his incision

through the linea alba, and after removing the fœtus, he cut off the cord near the placenta, which he could not find, and which he left undisturbed. The wound was closed except at its lower part where a glass drainage-tube was inserted. After a few weeks the placenta presented at the opening left in the abdomen and was extracted. The great importance of not removing the placenta in operations for extra-uterine pregnancy is emphasized by Playfair and many modern operators, especially Lawson Tait. According to Dr. Harris its non-removal was first urged upon the medical profession in 1791, by Mr. William Trumbull, of London; and again advocated in 1795 by Dr. James Mease, of Philadelphia, who had witnessed a successful operation, so far as the mother was concerned, by Dr. Charles McKnight, of New York, where the placenta was not removed, because it could not at the time be found.

Byford recommends in gastrotomy for abdominal pregnancy that the cord be excised within an inch or two of the placenta, and that a strong thread of silk be attached to the placental stub, and be drawn out through the inferior part of the womb, in order that slight traction may be made on the placenta from day to day until it is detached from its adhesions, and is removed through the opening, which may be enlarged for that purpose if necessary.

So far as surgical aid is concerned in abdominal pregnancy it is a much-debated question whether it is advisable to adopt any active treatment until near the full term of development of the fœtus, either in the way of puncturing the cyst with the object of destroying the fœtus, or of the extraction of the latter by gastrotomy. The majority of authorities advise waiting until near the full term, for the reason that there is not in abdominal pregnancy the same risk of death from rupture of the cyst as in tubal pregnancies.

In the latter variety of pregnancy aspiration both as a means of diagnosis, and for the purpose of destroying the fœtus *at an early stage of development*, has been recommended. If all the liquor amnii be drawn away the fœtus dies, and no rupture takes place. A very great advantage is thus secured, besides confirming our diagnosis of extra-uterine pregnancy, for next to laying open the cyst and extracting the fœtus, or of excision of both cyst and fœtus, the death of the latter prior to the rupture of its coverings is the most desirable result obtainable, except the final

cure of the patient, because there is a reasonable hope of the fœtus remaining thereafter inert within its sac. Although aspiration is capable of destroying the fœtus, and thus checking its further development, it should be remembered, that it is a highly dangerous operation to the mother, as experience has abundantly proved. A much safer plan, and one highly recommended by eminent authorities, is, the passing of repeated currents of electricity through the tumor. This may be done in two ways, by electro-puncture, or by the application of galvanism through electrodes applied in the vicinity of the tumor. For instance, a vaginal electrode insulated, except at its tip, may have the latter applied to a point in the vagina nearest the tumor, while another electrode is placed on the abdomen over the most prominent part of the tumor. As the application is very painful it is better to use a mild current. It may be applied every day, or every other day for five or six days. If in an obstinate case it should be deemed best to use a stronger current for a little while; the pain might be prevented by an anæsthetic.

Although electricity in some of its forms has been recommended by writers at various times for the treatment of extra-uterine pregnancy, there are very few cases on record of its employment.

Bachetti, in 1853, applied electro-puncture successfully in arresting the growth of an extra-uterine cyst, and causing its absorption.

Greenhalgh, in 1867, and Martin, in 1868, each reported a successful case from the application of the continuous current through a needle, or a trocar and canula.

Berci, in 1872, applied electro-puncture successfully. Since then there have been at least five successful cases from the application of galvanism. Two by Dr. J. G. Allen, in 1869 and 1870; two by Dr. H. G. Landis, in 1877 and 1879; and one by Dr. J. C. Reeve, in 1879.

The following remarks upon Doctors Allen and Reeve's cases by Dr. Robert P. Harris, at a meeting of the Obstetrical Society, of Philadelphia, September 2d, 1880, will be found highly interesting:

"Dr. Harris reminded the society of the two cases of post-uterine abdominal pregnancy, reported by Dr. Joshua G. Allen, in 1872, both of which were cured by the death of the fœtuses, effected under repeated applications of the electro-magnetic current.

The pregnancies were each illegitimate, and came under observation at an early period, one being computed at three months, and the other at ten weeks. The former was operated upon in 1869, and the latter in 1870. After the death of the fœtus, in each instance, the tumor diminished in size, and the woman again menstruated. Both had an attack of peritonitis, and one was for a time confined to bed with pains over the sacrum and down the lower extremities. The two women married; one has had a child, now several years old, and is at this time a widow. The other has not been impregnated since her marriage. Both are now in good health, and the tumors can be felt in Douglas's cul-de-sac. Dr. J. C. Reeve, of Dayton, Ohio, has reported a case similar to those of Dr. Allen, on which he operated by the interrupted galvanic current, and with a similar result. In each case one electrode was placed in the post-cervical cul-de-sac, and the other over the abdomen. It would appear necessary, in order to the destruction of the fœtus, that the current should be quite severely felt. Dr. Allen regards his success as perfect in view of the present condition of the subjects. As long as these foreign bodies remain, there will always be a danger that at some future period they may become the nidus of inflammation and abscess. Such an abscess would be likely to point favorably, and discharge its contents per vaginam or per rectum, on account of the position of the fœtal mass. As the danger of a developing extra-uterine fœtus is very great, that of carrying a small one, destroyed by galvanism, is scarcely to be considered in comparison."

The best time for the employment of electricity in extra-uterine pregnancy is during the early months of gestation.

Treatment after Rupture.—In tubular fœtation, where no chance for arresting the growth of the ovum has presented itself, and rupture actually takes place, the chances of recovery are so slight that most practitioners content themselves in relieving the symptoms of pain, hemorrhage and collapse that follow, and if death is not the speedy result they endeavor to prevent a subsequent peritonitis, thus controlling many of the serious symptoms, and prolonging life with the hope that the effused blood may be removed by absorption, as occasionally occurs in hematocele located in the pelvis. But as rupture in cases of tubal pregnancy of over a month's standing has almost invariably a fatal termination, under the usual palliative treatment, it has been suggested

that gastrotomy might be resorted to, as it could hardly make the case more serious. That is, an incision should be made in the abdomen, the effused blood should be sponged up, and a ligature be placed around the lacerated tube, which should then be removed, together with its contents. If the embryo has already escaped into the abdominal cavity it must also be sought after and removed if possible. As death does not generally take place for several hours after rupture, there would ordinarily be time for the operation. The most serious obstacle being the collapse, it might be temporarily overcome by transfusion or stimuli.

It must be confessed, however, that there are not many surgeons bold enough to operate under such discouraging circumstances. But suppose the woman has carried the fœtus beyond the usual term of gestation without rupture having taken place, which can generally only occur in abdominal pregnancy, and her health begins to fail rapidly from intense suffering caused by its presence, ought either gastrotomy or vaginal extraction to be performed? In answer to this question I shall simply state that it may, or may not, according to the urgency and circumstances of the case, of which the surgeon must be the judge. Operations under these conditions have been successfully performed, the fœtus generally being dead.

There is one thing to be borne in mind, that in laying open the cyst or sac of an extra-uterine pregnancy, there is always far more hemorrhage than in a similar incision of the uterus for extraction of the fœtus, for the reason that when the fœtus is removed from the womb the latter contracts, and thus checks the flow of blood, but the sac of the fœtus outside of the uterus has no such power. It is hardly necessary to call the practitioner's attention to the necessity of facilitating the expulsion of the decomposed fœtus in all cases where no operation has been deemed advisable, but where nature, in her usual way, is making an effort to rid herself of it.

For example, should an incipient abscess be discovered in the rectum, vagina, or abdomen, resulting from the disintegration of the dead fœtus, it should be promoted by poultices, warm fomentations, etc., and at the proper time opened. Various instrumental means may then be used for the purpose of extracting parts or all of the decomposed mass.

Pregnancy in a Bi-lobed Uterus.—Having concluded the subject of extra-uterine pregnancy, I shall make a passing allusion to

another, closely allied to it; I mean pregnancy in the rudimentary horn of a bi-lobed uterus. It is thought that this form of gestation has often been mistaken for tubal pregnancy, as its progress, symptoms, and terminations are nearly identical.

When the rudimentary horn becomes distended to a certain point by the growing embryo it becomes ruptured; then the usual alarming symptoms from hemorrhage come on, succeeded in due time, if death does not immediately occur, by peritonitis, and afterwards by the phenomena of decomposition of the fœtus. As there is no method of distinguishing this form of pregnancy from the tubal before the death of the patient, and with difficulty then, I shall say no more concerning it.

CHAPTER XIII.

DEATH OF THE FŒTUS IN UTERO—MISSED LABOR—MOLE PREGNANCY.

It is often of the utmost importance that we should know whether the fœtus in utero be living or dead. We may, as experts, be called upon before a legal tribunal to give our opinion upon this question; but it forces itself upon us still oftener in the ordinary routine of practice, when our patients are frequently solicitous to be informed upon the subject. It assumes a more practical shape when we are called upon to perform operations in the practice of midwifery; as, in cases requiring the use of the forceps, the operation of turning, of craniotomy, of decapitation, of evisceration, the Cæsarean section, or laparo-elytrotomy.

For instance, although the extraction by the forceps is always preferable, when practicable, to craniotomy, when the child is living, yet there are many cases when the first operation is so difficult that if we know the child to be dead we would resort to the latter. It has a bearing also in determining the necessity of gastrotomy or gastro-hysterotomy after sudden death of the mother during the latter months of pregnancy, or labor, from convulsions, hemorrhage, rupture of the womb, or any other cause. Or, to state the matter in another way, if the child were living, we would shrink from the performance of any operation involving its death if there were a chance of extracting it by the forceps, or of delivering it by turning; but if the fœtus be dead, we could disregard it altogether, and resort to that operation which is the easiest of performance, and attended with the least danger to the mother; and, in the event of her death, no operation would be necessary.

Symptoms of Fœtal Death.—For the sake of convenience, we may arrange the symptoms indicating the death of the fœtus under two heads:

1. Those occurring prior to labor.
2. Those incidental to labor.

Those occurring before labor are chiefly the absence of motion

of the fœtus, and of the fœtal pulsation; flaccidity of the abdomen, instead of firmness, roundness, and elasticity. The abdomen even recedes so as to cause the umbilicus to be retracted instead of being protruded. The patient feels a dull, heavy weight in the inferior portion of the pelvis, as though the womb had prolapsed. The uterus appears to the woman to roll from side to side in accordance to her different positions. If the fœtus has been dead for a long time, the secretion of milk will cease, the mammæ will become flabby, and much diminished in size; the abdomen will greatly diminish; the patient loses her appetite and strength, and becomes languid, nervous, and depressed; her breath is fetid, her eyes sunken, with dark circles around them, and she is often troubled with more or less sickness of the stomach. The constitutional disturbance is sometimes so serious as to demand the induction of premature labor. But I must caution the physician against relying too much upon any one, or even all of these symptoms, as they may arise from other conditions of the system, independently of death of the fœtus. If, however, there be a concurrence of several of the most prominent symptoms just mentioned we may feel, if not confident, at least pretty sure that the fœtus is dead.

The most reliable symptoms of death can generally be obtained only DURING LABOR, when the os is open and permits an examination of the loose cranial bones, or when the cord is prolapsed so as to enable one to feel the absence of circulation in it. The first, though a valuable, is not an infallible symptom, as a child that is badly nourished and sickly will present the same condition of the cranial bones. But the most certain of all symptoms is the want of pulsation in a prolapsed cord if existing for a good while both during and in the absence of uterine contractions. The absence of the sounds of the fœtal heart, especially if they have been heard previously, is always a strong symptom either BEFORE or DURING labor. The escape of shiny, thick, and offensive liquor amnii, and the presence of meconium, when the breech does not present, are valuable, but not infallible signs.

Briefly, then, I shall state that if prior to labor the abdomen really becomes much smaller, the breasts, from being plump and large, and containing milk, shrivel up and cease to secrete it; if where, in the latter months of pregnancy, after several careful examinations at different times, no movements of the child are felt,

or pulsations of its heart heard, and especially if the latter symptoms once existed; or if, in a prolapsed cord during labor there is a prolonged absence of circulation, we may feel almost sure that death has occurred.

Missed Labor.—It is very seldom that we have an opportunity of seeing a case of that extraordinary form of abnormal pregnancy called "missed labor," in which, although the fœtus occupies its normal site in the womb, and arrives at the stage of full development and maturity, yet no efforts are made at the proper time for its expulsion, or if made, subside, and the fœtus, if not already dead, soon perishes, and remains in utero for an indefinite period of several weeks, months, or years. Of course putrefaction and disintegration commence after awhile in the fœtus, which is gradually broken up and discharged per vaginam. This change is accelerated by an early rupture of the membranes, which generally occurs about the true term of labor.

The mother usually dies of septicæmia, pyæmia, or some other pathological result of the retention of the putrid elements within the womb. However, it would seem that patients do sometimes recover, and that too while the dead fœtus is still retained in the uterus. The most remarkable case on record, both in regard to the recovery of the mother and the long detention of the dead child, is that of the negro slave of Virginia who died at the age of about seventy, having in her womb an ossified fœtus, which had probably been retained there for at least thirty years. The history of her case showed that when she was about forty years old she was taken with what was believed to be labor pains, which passed off without expelling the child. The woman was an invalid for several years, but finally recovered sufficiently to resume her ordinary duties.

After many years of moderate health she died of dysentery. A history of this case, together with the bony or petrified fœtus, was some years since presented to the New York Pathological Society.

Besides the above, there are other cases reported by men standing high in the profession—the most noted being those of Drs. Oldham and McClintock. In the latter case the woman was taken with labor pains at the time of her expected confinement, but they ceased without the child being born. A highly offensive discharge, and portions of the disintegrated fœtus, passed off per vaginam for

a period of sixty-seven weeks, ending in the death of the mother from pyæmia.

In another somewhat similar case, related by him, the fœtus was retained until the death of the mother from its disintegration eleven years after she ought to have been confined.

In Dr. Oldham's case the woman died three months subsequently to the labor pains, having in the meantime delivered herself of portions of the decayed and disintegrated fœtus; much the larger part of which, however, was found in the womb after death.

Although there is no doubt of the foregoing cases being true examples of what is termed missed labor, yet it is doubtless true that many of the reported cases of this kind are merely examples of abdominal fœtation.

Treatment.—After the period of labor has expired, and the child is known to be dead, but not yet badly decomposed, the cervix uteri should be dilated by sponge, laminaria, or tupelo tents, and afterwards enlarged still more by Moleworth's or Barnes's fluid dilators, and then the fœtus might be removed by turning. If decomposition has progressed too far for this operation, the putrefied mass, or as much of it as possible, should be extracted by the hand or placental forceps; the patient in either of these methods being under the influence of ether.

Electricity, ergot, pressure, and the vaginal douche might of course be tried as a preliminary, or adjunct, to the foregoing operative procedures.

Intra-uterine antiseptic injections of diluted carbolic acid, solution of chloride of zinc, solution of chloride of soda, and thymol, might be found useful in these cases, after the cervix uteri has been dilated, for the purpose of preventing septicæmia, and in some cases of stimulating uterine contractions in order to facilitate the expulsion of the disintegrated mass.

Degeneration of the Ovum or Mole Pregnancy.—The term "mole" has been very loosely applied by some authors to nearly all morbid products expelled from the womb, while others would limit its signification to some form of blighted ovum. Hence much confusion has arisen both in and out of the profession, giving rise in some instances to unmerited suspicion of the chastity of women, who, being unmarried, or absent from their husbands, happen to pass from the womb a morbid mass, which is called by the doctor a mole, without stating whether it be the

morbid product of pregnancy or not. Unfortunately there are physicians of limited experience who have been misled by some of our manuals of midwifery into the serious error of ascribing all these products to a degeneration of a fecundated ovum. Many a time have I known a cloud of suspicion to darken the sunny atmosphere of female youth and beauty by the carelessness, or ignorance, of the attending physician, in making a diagnosis in these cases. This delicate and important subject demands more consideration than most of our textbooks give it, and more than the nature of this work will permit me to assign to it, yet I hope that the few hints that I am enabled to offer will incite the young practitioner to a careful study of it in all its bearings—at least while he can spare the time in the early years of his professional career.

False and True Moles.—As, then, it is true that all morbid solid matters expelled from the womb are not moles, properly so called, or in other words the result of fecundation, it seems proper that we should draw a distinction between those that are not, and those that are, the products of impregnation; hence I shall adopt the division into "false" and "true" moles.

Under the heading of false moles may be included those shreds, or sometimes casts of the mucous membrane of the entire uterine cavity, that are thrown off in some women in each catamenial period, either in small pieces or one entire mass, giving rise to what is known as membranous dysmenorrhœa, the most intractable and distressful of all the varieties of painful menstruation. The mucous membrane of the uterus is in rare instances thus thrown off independently of the menses. It is very easy under these circumstances for a careless or ignorant physician to be misled into the belief that an abortion has occurred, and that the expelled membrane is a true decidua, or a fragment of a fecundated and partly developed ovum. In truth, as the expulsion is generally accompanied by hemorrhage, and sustained expulsive effort, it frequently embarrasses the most observing and experienced physician in his diagnosis. He may be aided in his efforts to find out the true nature of the discharged substance by remembering that analogous products are not very unusually expelled during the menstrual periods, and that the woman has never presented any of the usual symptoms of pregnancy. Besides

the expelled substance is more easily torn or broken up than the decidua, which has many well-developed utricular follicles or crypts, and foramina for the reception of the nutrient vessels of the womb. Moreover no trace of the transparent membranes of the ovum, nor any reflected layer forming an inner pouch can be detected in the shed mucous membrane or false mole.

Another variety of the latter is a fibrinous-looking, and sometimes semi-organized substance expelled from the womb during certain functional derangements of this organ, especially when accompanied by inflammation. These substances vary greatly in size, are of a firm consistence, and often resemble the form of a cast of the cavity of the womb. They are generally neither more nor less than altered and condensed clots of blood, which vary in color in proportion to the disappearance of their red globules. Sometimes they may consist in part of clot and in part of lymph, and sometimes of a membranous cast enveloped in a layer of condensed and altered blood-clot.

Besides the above varieties of false mole we may include under this designation substances composed chiefly of expelled flakes or casts of the squamous epithelium of the vagina, thrown off singly, or in masses, of more or less bulk, but never of any great dimensions.

True Moles.—The *true* moles differ from the *false* in being blighted ova. There are several varieties of them. In one variety the membranes have become greatly hypertrophied, so as to form a thick, fleshy mass, while the embryo itself has failed to be developed in a corresponding degree, or has dwindled away, been dissolved, or expelled from the womb. The enlargement of the womb, and consequently of the abdomen, in this variety of mole, may even be greater than it would be if the pregnancy were normal; but not so great as in that variety of mole pregnancy called the hydatidiform degeneration of the chorion, to be considered presently. The cause of this form of mole pregnancy, and in fact of all the varieties, may be in the embryo itself, or in its membranes, or in the lining or mucous membrane of the uterus, or some maternal constitutional taint, especially syphilis; one of the most common causes being an endometritis existing even prior to the period of conception.

It is easy to conceive that when the impregnated ovule reaches the uterus, and becomes engrafted on its inflamed mucous mem-

brane, that its prospect of growth and development is, from this very fact, greatly lessened. The consequence is very often a laceration of some of the decidual vessels, hemorrhage between the uterine walls and the decidua, and finally expulsion of the blighted mass.

Thus abortion may be the result of chronic endometritis, which is a very intractable and not an uncommon disease of females. The diseased mass is not, however, always expelled at one time, or at the beginning of its pathological condition. But, as just stated, the embryo itself is generally the first to disappear, either by disintegration, solution, or expulsion, or by two or all of these means in combination, leaving a portion or all of the membranes behind, for a time, to undergo various changes, one of which, hypertrophy, has just been mentioned. A mole, formed by hypertrophy of the fœtal membranes, often becomes as large in the third month as the impregnated ovum, if not blighted, would be in five months. It increases in density as well as bulk for some time, occasionally for several months, and is then expelled from the uterus, giving rise, sometimes, to dangerous hemorrhage before its total expulsion.

Occasionally, after the death of the embryo, the ovular structures, if retained for any length of time, will take on that peculiar pathological condition called fatty degeneration; or, if retained for a very long period, assume a calcareous degeneration. The pathologist must, however, be careful not to confound a calcareous degeneration of the membranes, or placenta, with a similar degeneration of a fibroid tumor of the uterus.

The Hydatidiform Mole.—The most important variety of mole pregnancy is the hydatidiform, or vesicular mole, the first name being applied to it under the erroneous notion of its being a true hydatidiform disease, similar to that which manifests itself in the liver and other structures. Upon a more careful examination, however, pathologists have long come to the conclusion that they are not true hydatids, consisting of closed sacs within one another, but, on the contrary, that some of the vesicles grow out of each other, while others have pedicles of variable length attached to the chorion (Fig. 61). As the stalks do not unite into common or principal stems, it is inappropriate to compare them, as some have done, to currants, or as others, to bunches of grapes, except in a general way.

They consist of vesicles, varying in size from mustard-seed to

sparrow's eggs, containing a limpid fluid analogous to the liquor amnii. These vesicles arise from a degeneration of the chorion

FIG. 61.

Hydatidiform Degeneration of Ovum.

villi, and are not therefore entirely new formations, but merely transformations of existing structures. The first abnormal change usually commences at an early stage of pregnancy, even prior to the formation of the placenta, and rarely later than the tenth week. It seems to take place in the epithelial lining of the villi by the formation of numerous cells, some of which burst or liquefy, and these gradually produce a distension of the villi into small bladder-like bodies. While this change is in progress the connective tissue of each diseased villus is augmented at certain points by proliferation.

CAUSES.—Various theories have been advanced in regard to the etiology of the hydatidiform mole. Some pathologists are of opinion that it originates from a syphilitic taint of the maternal blood, while Virchow and others ascribe it to a pathological condition of the decidua.

Graily Hewitt believes that this disease is the result of the death of the embryo. Others are of the opinion that the de-

generation of the chorion villi is the first step in the process, and that the death of the embryo is the effect and not the cause of this pathological condition. Although there is a diversity of opinion in regard to the starting-point or primary cause of this disease, all authorities agree that it essentially consists in a peculiar transformation of the villi of the chorion. In other words, instead of each villus remaining a tubule, it has been gradually changed into a cyst, and filled with fluid from the liquefaction of some of the new cell elements in its cavity.

As already stated the disease is thought to have a very early origin, as the most careful examination has never been able to detect any trace of the fœtus, which is believed to perish in the first few weeks of its existence.

The rapidity and degree of development of this variety of mole are truly wonderful. The uterine and abdominal enlargement is nearly always much greater than would be the case for the same period of normal pregnancy. The contents of the womb sometimes amount to several gallons.

It was formerly maintained, especially by Ramsbotham and Montgomery, that a portion of the placenta retained at the full term of pregnancy might be converted into a hydatidiform mole; but modern authorities deny the possibility of such an occurrence.

Although hydatidiform degeneration of the chorion is essentially connected with pregnancy, yet as true hydatids, which have no relation to this condition, may, in rare cases, find their way into the uterine cavity from the neighboring organs, or from the walls of the uterus, or still more rarely be formed in the cavity of the uterus itself, it is important for the physician to be on his guard in giving an opinion when true entozoa are expelled per vaginam, or he may give rise to groundless suspicions as to the chastity of his patient in case she be a widow, or an unmarried person. A careful microscopic examination of the cysts and their contents would enable the physician to distinguish the true hydatids from the hydatidiform cysts, as the characteristic hooklets of the heads of the former could thereby be discovered.

It should also be borne in mind that the true hydatid cysts are inclosed one within another, whereas the hydatidiform vesicles are attached to each other by slight pedicles, or grow on the outside, instead of the inside of each other. It is well for the prac-

titioner to remember that a patient may expel a mass of hydatids long after impregnation, even months and years, as only a portion may be expelled at a time, when the residue will produce new vesicles, to be passed off at a subsequent period. As this may happen in a widow, it might create a false opinion in regard to her chastity, unless properly understood and explained by her physician.

Symptoms of Hydatidiform Moles.—There are no characteristic symptoms of mole pregnancy until portions of the cysts become discharged from the uterus. The early symptoms especially have little or nothing to denote the character of the disease, but as pregnancy advances there is more general disturbance of the system than normal pregnancy ought to produce, and there is occasionally a sudden cessation of sympathetic phenomena, but vomiting may even be worse than in a healthy gestation. Occasionally there is an absence of the normal signs of pregnancy, and indications of the death of the fœtus.

The enlargement of the uterus, and consequently of the abdomen, is often much greater than normal gestation could produce for the same period ; thus we may find the uterus at the fourth month as large as it ought to be at the seventh, eighth, or even ninth month of pregnancy. About the third or fourth month there are generally more or less profuse discharges from the vagina of a watery and sanguineous character, somewhat resembling currant-juice, depending upon the breaking down and expulsion of hydatidiform cysts. These discharges are sometimes very copious and frequent, and produce great weakness and depression in the patient. Portions or large masses of cysts may frequently be observed in these discharges, leaving no doubt as to the nature of the pathological condition of the ovum and its appendages.

In forming a diagnosis of this disease prior to this characteristic discharge, it is important to bear in mind that *ballottement* is generally, and fœtal pulsation always, absent.

In the variety of mole pregnancy under consideration hemorrhage is very apt to take place, and in proportion to the extent of the separation of the vesicular mass from the uterus. It is sometimes so alarming that extraction of the mole may be rendered absolutely necessary to prevent a fatal termination.

Treatment.—The treatment of mole pregnancy must be regulated according to the circumstances of each case, but may, in

general terms, be stated as being the same as for abortion. If excessive hemorrhage occurs before the diagnosis of the complaint is fully established, it is proper to resort to the internal use of acetate of lead, gallic acid, etc., and to astringent injections and the tampon, but when we have ascertained the true nature of the disease it becomes our duty to clear the uterus of its contents without delay. With this end in view we may administer ergot, to induce contraction of the uterus and expulsion of its contents. This failing, we must endeavor to pass one or more fingers, or the whole hand, into the uterus, so as to remove as much as possible of the mole. The preliminary use of a vaginal plug may, besides temporarily checking the hemorrhage, cause the os uteri to dilate sufficiently for this operation to be easily accomplished. But it often becomes necessary to dilate the os with sponge, laminaria, or tupelo tents, or even by Barnes's rubber dilators when there is sufficient dilatation for their insertion. These agents check the hemorrhage for the time being, and dilate the os uteri so as to enable the physician to properly introduce his finger, his hand, or a placental forceps, and extract the hydatidiform mass. The operation is rendered still more easy by the administration of chloroform after the proper dilatation, and just as the finger is inserted.

Sometimes Molesworth's climax dilator, or Hank's dilator, or Hunter's dilator, may be used to greater advantage than Barnes's bags, which, besides being hard to insert unless the cervix is already partially dilated, often burst after insertion.

Of course when there is a twin pregnancy and only one ovum diseased, such treatment would involve the death of the living embryo, and should not therefore under such circumstances be adopted, unless the loss of blood is so great as to threaten the life of the patient if it be not used.

As the diagnosis of twin pregnancy in the early months is generally impracticable, and often uncertain at any period of gestation, the proper course to pursue is not always clear to even the most experienced obstetrician.

Under such embarrassing circumstances it is wise for the physician to call in the aid of a brother or sister practitioner, for if he does not and anything goes amiss he is sure to be censured.

CHAPTER XIV.

DISEASES OF PREGNANCY.

If the various pathological conditions of the uterus and its appendages, and even its ordinary physiological function of menstruation, have marked effects upon other parts of the system, it is not at all strange that the wonderful changes the womb undergoes during gestation, in size, situation, and functional activity, to meet the demands of the complex being that has sought a temporary home in its cavity, should also create functional disturbances in other organs.

The effect of pregnancy is not only to modify many of the diseases to which both pregnant and non-pregnant women are liable, but to create special sympathetic disturbances of a more or less marked character.

It is therefore the custom of obstetric writers to call attention to a few of the most prominent disorders thus either sympathetically produced or modified by pregnancy. To enter into the subject fully would be impossible in a work devoted only to obstetrics.

While the great majority of women pass through the whole period of gestation without experiencing much disturbance or inconvenience in the healthy or physiological action of their various functions, others are invalids much or most of the time, and a few are really more healthy than ordinarily, as some serious and lingering affection under which they are laboring may be held in temporary abeyance.

Disorders of the Digestive System.—The most prominent derangements of the digestive functions depending upon sympathetic irritation are *nausea* and *vomiting*, which are the common accompaniments of pregnancy, and under ordinary circumstances can hardly be considered as pathological conditions requiring the attention of the physician, but they are sometimes so excessive and long continued as to lead to inanition, extreme debility, and even death itself. They may last through the whole period of pregnancy, or for a few weeks only.

They commonly begin three or four weeks after conception, and disappear when the period of quickening has been reached. So long as these functional disturbances continue as a mild "morning sickness" they require no assistance; but when the stomach rejects almost everything swallowed, and the nausea is constant and distressing, the physician must try means of relief.

It is surprising how severely and how long some women will suffer from constant irritability of the stomach without becoming thin and emaciated, or even greatly debilitated. But in the worst class of cases very serious results sometimes follow continuous and painful retching and vomiting. They may even end in death. These grave cases are characterized by a dry coated tongue, haggard countenance, great nervous irritability, tenderness on pressure over the epigastrium, extreme restlessness, morbid vigilance, and general feverishness. The pulse is thready, small, and frequent. Emaciation follows, accompanied by a dry, brown tongue, fetid breath, profound exhaustion, and low delirium. Unless relief is given, death finally closes the scene. The latter termination is fortunately extremely rare. Even the worst symptoms will sometimes disappear rapidly if abortion or delivery occurs spontaneously or artificially.

TREATMENT.—There is hardly a medicine in the pharmacopœia that has not been vaunted by some physician as a remedy in nausea and vomiting of pregnancy. The fact is that there are very few medicines that can be relied upon in all or even the majority of cases; and a long experience will cause the practitioner to feel that he must often cater to the whims and fancies of his patients, and sometimes give them remedies and articles of food that his judgment would condemn. Nevertheless there are medicines and regulations of diet which are of undoubted benefit to the great majority of patients. Prominent among these are the carbonate and subnitrate of bismuth, given in a little soda-water, or in the form of a pleasant elixir; the oxalate and nitrate of cerium and bicarbonate of potash, especially in a granular effervescent state as prepared by Bishop; pepsin and lacto-peptine in the form of an elixir. Sometimes a little spearmint or peppermint-water, or tincture of cardamom, or a few drops of tincture of lavender on a lump of white sugar, will afford relief.

Where the vomiting is severe and the retching almost constant and accompanied by thirst, small lumps of ice held in the mouth

and the water swallowed as the ice melts, is highly useful if conjoined with the exclusion of all drinks and articles of diet, except in the smallest quantities, frequently repeated, and either warm, or cool, or iced, as may suit the fancy of individual cases. Although the use of the salts of morphia is often followed by vomiting in persons not otherwise troubled with this symptom, I have frequently found them highly useful in the vomiting of pregnancy dissolved in peppermint or spearmint-water, or distilled water flavored with a little tincture of cardamom or lavender. Occasionally a little iced champagne or brandy will prove serviceable. Effervescing draughts with or without from three to five minims of dilute hydrocyanic acid; tincture of nux vomica in doses of ten minims; a drop of creosote mixed with syrup of acacia or syrup of orange-flowers; salicine in doses of three to four grains every five hours, are recommended by some authorities.

When there is great epigastric tenderness, a spiced poultice, made of ground cloves, cinnamon, and warm whiskey, or spirits of some kind, placed over the stomach, is useful; or a few leeches applied, or the surface blistered and sprinkled with a third of a grain of the sulphate, acetate, or muriate of morphia.

Some cases are benefited by the application of an ice-bag to the spine or epigastrium. Where the bowels are constipated, aperients and purgatives by the mouth or rectum are occasionally highly useful.

Regulation of the Diet.—Many cases can be controlled by a proper regulation of the diet without resort to medicinal agents, and the action of the latter is often rendered nugatory by inattention on this point. A little pleasant and digestible food, such as half a cup of milk, or coffee, or cocoa and milk, with or without a cracker or piece of biscuit, taken on awakening and before rising in the morning, will prevent, or render less severe the morning sickness of some women. Iced milk and cold beef jelly in spoonful quantities will often be kept down when everything else would be rejected. Barley-water, cornmeal or oatmeal gruel, blanc-mange, ice-cream, beef, mutton, or chicken broth, essence of beef in small quantities at a time, will sometimes be retained by the stomach. Some patients require their food cold and others warm. Sometimes we may cater to the whimsical fancies and cravings of individual cases, and allow even articles of food that our judgment would forbid.

Change of Habitation, Air, and Scenery.—In some cases, where all forms of treatment have utterly failed, and the patients have seemed on the verge of death from inanition, I have found surprisingly beneficial results from a change of habitation, air, and scenery, especially from a badly-ventilated house in an unhealthy part of a crowded city to a salubrious residence in the mountains, or on the ocean beach.

Local Treatment.—Some practitioners rely chiefly on applications to the womb itself, others on efforts of rectification of any displacement of this organ that may chance to occur. The former, attributing the reflex disturbances of the stomach to irritability of the uterus, recommend morphia in the form of suppositories, and pessaries per vaginam, or an ointment of belladonna applied to the cervix uteri. Dr. Henry Bennet believes that the symptoms are owing almost always to congestion and inflammation of the cervix, and that they are best met by the application, through the speculum, of nitrate of silver. A few others, who believe in the theory of uterine inflammation, advise it to be combated by the application to the cervix uteri of one or two leeches.

Dr. Jones recommends the patient to be placed in the left lateral semi-prone position, a Sims's speculum to be used in exposing the cervix uteri, and the granular surface of the latter to be brushed with a solution of lunar caustic. Those who have a fancy for heroic treatment may try the above methods in some cases, or follow the plans of Graily Hewitt and Copeman. I am inclined to the opinion, however, that such radical and perturbating modes of treatment as they recommend are too apt to result in abortion, for adoption except in special and very obstinate cases. Although gastric irritability may be aggravated by displacements of the uterus, it generally exists entirely independently of these conditions. Should the latter complications be present, they must be met by appropriate treatment, to be described hereafter.

Induction of Premature Expulsion of the Fœtus.—Finding that most aggravated disturbances of the stomach sometimes cease after spontaneous abortion, the question of artificial abortion as a *dernier ressort* forces itself upon us for consideration. Cazeaux is opposed to this operation except after the seventh month of gestation, when the child need not necessarily be sacrificed. Other authorities recommend it in the worst class of cases

of vomiting, when all other treatment has been tried in vain, and the life of the woman is in extreme peril, whether gestation has or has not advanced to the stage of viability of the child. There seems to be no doubt that a few mothers have been saved by the timely induction of premature expulsion of the fœtus, and in all probability others have died because this measure has not been resorted to; it must therefore be admitted that under rare and exceptional cases it may be tried at any stage of pregnancy. But the obstetrician should never have recourse to it without the sanction of one or more consulting physicians. The success of the operation demands that it be performed before the patient becomes so prostrated as to render it entirely useless. As the indication in these cases is to lessen the tension of the uterus as soon as possible, it is considered best to bring on abortion by puncturing the membranes with a uterine sound, uterine probe, a bougie, or stilet guided through a catheter open at both ends, and allow the escape of the liquor amnii, thus affording immediate partial relief, which becomes more complete when the fœtus is expelled.

Other Gastric Disorders.—Anorexia, or want of appetite, and even a loathing and disgust of food, is a prominent disorder of the stomach during the early months of gestation, but yet is not confined to that period. The patient may also be annoyed by heartburn, acidity, flatulent distension, and neuralgia of the stomach; also, by a morbid or capricious appetite, characterized by a longing for strange and even disgusting articles of diet.

Treatment.—These symptoms must be met by a light, easily digested diet, occasional aperients, and bismuth in some form, the liquor and elixir being the most pleasant and reliable. Vegetable bitters, the mineral acids, pepsin, soda, and lacto-peptine may all be found beneficial.

Albuminuria.—At present I can only give an outline of this important condition of the urine in pregnancy and of its occasional association with serious pathological changes in the system, but may if space permit discuss the subject more fully at some future time. Albuminuria, as associated with pregnancy, was little known to the profession until within about thirty years. Rayer, in France, and Lever, in Great Britain, were the first to call attention to its intimate connection with that fearful disease puerperal eclampsia, which was for many years believed to be

essentially dependent upon it, or rather upon one of its occasional conditions,—uræmia.

Recently, however, it has been shown that albuminuria does not always precede the convulsions, but in some cases follows them, and may therefore sometimes be the result, instead of the cause, of the pathological condition. Albuminuria is also intimately associated with other affections in the pregnant woman, such as puerperal mania, dizziness, headache, and certain forms of paralysis, either of the nerves of special sense, as amaurosis, or of the spinal system. The exact nature of the relation of albuminuria with its associated diseases is not yet fully understood, but its presence in the pregnant woman, though not always so intractable as when occurring in the chronic form, or true Bright's disease, either in the non-pregnant female or the male, is always a source of serious apprehension, as it may give rise to dangerous complications, which will be noticed separately hereafter. Albuminuria in its transient form, both in the pregnant and non-pregnant person, is called by some authors acute Bright's disease, and is considered as being usually curable, whereas the chronic form is generally incurable.

Symptoms.—One of the most common symptoms of albuminuria being *anasarca*, or a dropsical condition of the subcutaneous cellular tissue, especially of the lower and upper extremities and of the face, it is the duty of the physician, when he observes this symptom, to make a careful examination of the urine by the usual means of heat, nitric acid, the urinometer, and the microscope. There is an œdematous swelling of the lower limbs in many pregnant women dependent upon the pressure of the gravid uterus upon the abdominal venous circulation, which has no association with albuminuria, but we cannot always form a differential diagnosis between the two conditions except by a careful examination of the urine. This examination is often necessary when there is no œdema, for the latter is not always present even in severe cases of albuminuria. It may occasionally show itself in the face in the morning after the woman has been for several hours in bed, and disappear after she has been up for awhile.

Sometimes there is anasarca of the subcutaneous cellular tissue of the whole body. There are also many anomalous nervous symptoms connected with albuminuria, such as transient dizziness, headache, dimness of vision, inability to see objects distinctly, spots

before the eyes, sickness of the stomach in women who do not suffer from nausea. If the patient presents any of the above, or any unusual symptoms during pregnancy, the urine ought to be examined, that we may guard against many of the grave diseases so often associated with albuminuria.

The name albuminuria signifies albumen in the urine. The latter may contain only a trace of albumen, so as to produce only a little cloudiness upon the application of heat and nitric acid, or it may hold in solution such a quantity as to become almost solidified when the albumen is coagulated by the agents just mentioned.

Contrary to the common belief among patients, the mere physical appearance of the urine as regards cloudiness, ropiness, etc., has very little signification as to the presence of albumen in it.

Prognosis.—Blot and Litzmann have shown that albumen is found in the urine in more than twenty per cent. of pregnant women; and that the percentage exceeds even this in primiparæ. As the mortality of pregnancy and childbirth is only slightly increased by its presence, we cannot look upon it as possessing the grave prognosis of chronic albuminuria or chronic Bright's disease. Still it is true that the mortality of pregnancy and childbirth is somewhat increased, either directly by albuminuria, or indirectly by some of its associated diseases—such as puerperal mania and convulsions, which will be discussed hereafter. Hence the discovery of albumen in any great quantity in the urine of a pregnant woman must create more or less anxiety for her safety.

One source of anxiety is the danger of the morbid state of the kidneys, known as albuminuria, becoming chronic. And if we must place full reliance on the observations of Grubeyre, it would appear that forty-nine per cent. of primiparæ who have albuminuria, and who escape convulsions, ultimately die from pathological conditions traceable to albuminuria.

Besides increasing the gravity of the mother's condition in pregnancy, there seems to be no doubt but that albuminuria predisposes to abortion; probably by impoverishing the blood of its albumen, and thus rendering the life of the fœtus more uncertain and precarious.

Causes of Puerperal Albuminuria.—We are not able as yet to state positively the true causes of albuminuria when associated with the puerperal condition. Many ingenious theories have been offered on the subject, one of the most plausible being that al-

buminuria is produced from congestion of the venous circulation of the kidneys, caused by mechanical pressure of the renal blood-vessels by the gravid uterus. While this is probably true occasionally, yet it cannot be the only cause, for an equal amount of pressure may be brought to bear on the same vessels by fibroid and ovarian tumors, without albuminuria resulting therefrom.

It is generally admitted that a sudden cold may develop it by producing active congestion of the kidneys. It is also believed that the *altered state of the blood* in pregnancy, resulting from the unusual call for nutritive supply by the fœtus, thereby rendering this fluid more albuminous than in its normal condition, is another important factor in the production of albuminuria.

TREATMENT.—In order to gain the best results from the treatment of puerperal albuminuria and secure the patient so far as possible from its culmination into convulsions about or during the period of labor, the attending physician should examine closely all cases with suspicious symptoms when it is in his power to do so.

Unfortunately he is rarely consulted until parturition has actually commenced, or the woman is already in convulsions.

The treatment must of course be modified to meet the various indications of the case, such as the cause, when ascertainable, the grade of the complaint, and the period of its prevalence—whether during pregnancy, labor, or the puerperal state. The indications of treatment are often obscure, and the remedies uncertain. However, it is the duty of the physician to avail himself of every possible means of relief, and adapt them to the circumstances of the case. A slight trace of albumen in the urine, for instance, with no pending constitutional disturbances, would not require the same heroic treatment that might be demanded when convulsions are actually threatening the life of the patient.

Even when we have ascertained the cause of the albuminuria we cannot always attempt its removal. For example, if it be traced to pressure of the gravid uterus upon the surrounding organs, thereby producing a hyperæmic condition of the renal blood-vessels, it is not desirable, except in serious cases like convulsions, and not often then, to produce premature labor. But the hyperæmia may be relieved by proper diuretics. For this purpose we should give our patient the bitartrate, acetate, or citrate of potash, conjoined occasionally with small doses of one of the preparations of digitalis, the tincture or infusion, for instance. The

latter remedy, however, being accumulative in its action, must be used with great circumspection. I have seen more harm result from its use by careless practitioners than good by the most cautious. Free use may also be made of the following mineral waters: the Seltzer, Vichy, Hunyadi Janos, Friedrichshall, Apollinaris, and Pülna. Hydragogue laxatives may also be usefully employed, especially after labor. During gestation they are not so safe as the diuretics just mentioned, as they have a tendency in full doses to produce premature labor.

The best remedy of this class is the compound powder of jalap, although Rochelle salts, and the citrate of magnesia, may be advantageously used. The latter should be administered in the form of the Liq. Magnes. Cit., or the granular Magnes. Cit. Benzoic acid is highly recommended by some practitioners.

It is supposed by Frerichs to act by neutralizing the carbonate of ammonia, which, according to his theory, is formed in the blood by the decomposition of the urea, which is retained in the system in cases of albuminuria instead of being eliminated as in health.

After the use of some of the remedies recommended for a little while, we may assist the recovery of the patient by the tincture of the chloride of iron. It not only acts as a diuretic, but improves the condition of the blood by reproducing the relative proportion of hematosine. We should also endeavor to prevent nervous disturbances, which sometimes culminate in paralysis or convulsions, by regulating the digestive organs, especially the bowels, forbidding all intemperance in eating and drinking, and all undue excitement or overwork of mind and body. And, above all, by inducing regular repose in sleep at night—if possible by hygienic measures only, but otherwise by an occasional dose of hydrate of chloral, bromide of potassium or morphia, separate or in combination. Free ventilation, moderate exercise in pure air, and temperate habits, will generally insure sufficient sleep and be of great benefit in other ways. Dry cupping over the loins frequently repeated is of service in lessening the congestion of the kidneys. The vapor-bath is also of signal benefit. The diet should be light and easily assimilated, milk being the most useful.

Shall Labor be Induced Prematurely?—Professional opinion is divided as to the necessity of inducing premature labor in cases of albuminuria. But the majority of the latest and best authors advise it in all cases when other treatment has been tried in vain

and the death of the mother seems highly probable unless it be accomplished.

In cases, for example, where the urine is loaded with albumen, and the patient is seized with severe headache, dizziness, and amaurosis, and other symptoms of approaching convulsions, and especially when the ordinary treatment has failed to diminish the albumen, and the child is viable, it would seem to be proper to produce abortion.

When convulsions have occurred it is sometimes, but not generally, right to induce premature labor, or to hasten the parturient effort when labor has set in. I shall defer the discussion of the latter point until we treat of convulsions, but must remind the practitioner, especially if a young man, to confer with a brother physician in all cases where premature expulsion of the fœtus is deemed advisable, whether it be a case of albuminuria or any other.

Dropsy of the Cellular Tissue.—In the summary just given of albuminuria, the reader was cautioned against mistaking an ordinary anasarca, or œdema, especially of the inferior extremities and vulva, for the dropsy attendant upon albuminuria. He cannot, however, be sure of the differential diagnosis without careful and repeated examinations of the urine by the usual test of heat and nitric acid. I say repeated examinations, and at the intervals of several days or weeks, for there may be no trace of albumen in the first, second, or even tenth examination, and yet it may manifest itself in the eleventh. The dropsy without albumen is more apt to make its first appearance in, and even confine itself to, the lower limbs, while the converse is true of the dropsy accompanying albuminuria; still the above tests must be used to insure certainty.

There are various names given to the serous effusion, according to its causes and localities, but it is impossible in an obstetric work to enter into a description of the renal, hepatic, and cardiac divisions, or its several varieties, in accordance with the particular serous cavity or division of the subareolar tissue where it may chance to be located. Simple œdema of the lower extremities and vulva is most generally owing to pressure of the child on the inferior vena cava or other great venous trunks passing up through the pelvis, and is most common where the pressure is greatest, or during the last few months of pregnancy.

TREATMENT.—Where the effusion is owing to pressure very little can be done towards getting rid of it until labor is over, when it will cease of itself owing to the removal of its cause. Still, much may be done in the way of alleviation by elastic bandages and stockings applied to the affected limbs. If the effusion has its origin, as general dropsy of the cellular tissue is apt to have, in the kidneys, liver, heart, or blood itself, the physician must recall the principles of pathology and therapeutics applicable to these various conditions as learned in the theory and practice of medicine.

If the patient be in a state of chloro-anæmia, she must be put upon the tonics, especially of a ferruginous character, as will be pointed out when this disorder of pregnancy shall be discussed. Diuretic drinks are nearly always requisite in any variety of dropsy.

CHOREA.—This is fortunately a very rare complication of pregnancy, and mostly occurs in young, highly nervous women, who have had it in girlhood. It is most apt to occur during a first pregnancy. It adds greatly to the danger of both child and mother—proving fatal to most of the former, and about one-third of the latter.

TREATMENT.—In the treatment we must ring the changes on the various preparations of iron if the patient be chloro-anæmic; but the monobromate of camphor, the bromides of sodium, potassium, and iron; belladonna, chloroform, chloral, morphia, cimicifuga, and phosphide of zinc may be tried by turns. Some authors place great reliance on asafœtida and liquor arsenicalis.

MENTAL DEPRESSION.—Pregnancy is sometimes accompanied by depression of spirits, and occasionally with profound melancholy —the mother having forebodings of evil to herself or her child, which it is needless to state never prove true, except occasionally as a mere coincidence. No special treatment is called for in such cases.

HYSTERIA.—Authors do not say much about hysteria in pregnant women except in its graver form of convulsions, yet it is quite common at the commencement of gestation. It is at this stage too that hysterical convulsions are most frequent. Indigestion, excessive fatigue, or loss of sleep may produce an attack. It does not differ essentially from hysteria in the non-pregnant woman in symptoms or treatment.

TREATMENT.—Medicinal measures are not often required except the disease culminates in convulsions, when chloroform, chloral, bromide of potassium or sodium, and the preparations of opium will be demanded. Asafœtida, valerian, and Hoffman's anodyne are also useful.

The treatment between the paroxysms must be regulated by the nature of the case. As it differs but little from that adopted in the unimpregnated condition, a description of it here is unnecessary.

PARALYSIS.—Pregnant women seem to be more liable to the various forms of paralysis than the unimpregnated. The subject is extremely interesting, but as it is entirely too vast for full consideration in a work on obstetrics, it can only be said in a general way that as the disease seems in many cases to be associated with albuminuria and dependent upon uræmia, it must cease with the cause of its production, and therefore be more temporary in its character than when affecting the non-pregnant woman.

TREATMENT.—It is recommended by modern authorities that when paralysis makes its appearance in a pregnant woman whose urine is loaded with albumen, that premature labor ought to be induced at the earliest possible moment. Having thus removed the cause, the malady will most likely disappear very soon. If it do not, it must be treated by faradization, strychnia, and the various preparations of iron, cinchona, etc., conjoined with friction, bathing, and change of climate if necessary. In those examples of paralysis not associated with albuminuria, premature labor would be improper.

Pressure of the child's cranium upon the nerves of the pelvic cavity will sometimes produce a partial paralysis of one of the inferior limbs, commonly the left. As the cause is transient, the paralysis will generally disappear after its cessation.

SYNCOPE.—Pregnant women are more apt than others to be troubled with fainting, particularly about the period of quickening. The syncope is rarely cardiac or complete, there being more or less consciousness. The patient may lie with widely dilated pupils, a feeble pulse, and partial unconsciousness for several minutes, or much longer.

TREATMENT.—Place the patient in a recumbent posture, with her head low. Let her have abundance of fresh air; apply ammonia in one of its numerous forms to her nostrils, being particular not to use it in too concentrated a form, or to hold it too close to the

nose. Apply sinapisms to the extremities and stomach. As soon as the patient can swallow, administer to her from a third to a teaspoonful of spir. ammoniæ aromatic., or spir. æther. comp., or tinc. valerian. ammoniatæ, in about two tablespoonfuls of water, or brandy toddy, every hour or two, until she fully rallies. In mild cases one or two teaspoonfuls of the elix. ammoniæ valerianatæ may be administered every half hour until the patient has fairly recovered.

The inhalation of three or four drops of amyl. nitris will occasionally be of service.

Facial Neuralgia.—The physician will often be consulted by pregnant women with neuralgia of the face, as it is very common at such periods, and is usually associated with caries of the teeth, which is sometimes actually caused by acid secretions of the mouth resulting from gestation.

Treatment.—Anodyne embrocations externally will often be found useful, such as:

℞. Chloral hydrat., camphoræ, āā, ... ℥i.
Misce. Triturate until liquefied,

then add, tinc. opii, f℥ij, or equal parts of soap liniment and laudanum, and a moderate quantity of the tinct. aconite and chloroform, etc. Toothache drops, composed of creosote and oil of cloves, or laudanum, ether, or chloroform, applied on cotton-wool, are sometimes of service. If the pain be so great and continuous at night as to keep the woman from sleeping, we may have to administer some of the preparations of opium—especially the salts of morphia, by the mouth or hypodermically; or an occasional dose of hydrate of chloral, combined or not with the acetate of morphia. Tyler Smith thinks that quinine and the lighter preparations of iron are useful in such cases, but repeats the usual caution about the extraction of teeth. Playfair concurs as to the use of quinine, but does not admit that there is much risk in having the decayed tooth or teeth pulled out. I have known too many abortions produced by the extraction of teeth to agree with the latter author. As to quinine, it may be administered to a moderate extent, but it will not do to ignore entirely the opinion of a few modern authorities, who assert that in large doses it will act as an oxytocic.

Painful Mammæ.—The mammæ occasionally become excessively congested and painful during gestation, and if not relieved may

become inflamed. The application of warm fomentations, poultices, or anodyne embrocations is usually all that is required for relief.

Leucorrhœa.—This far from uncommon female trouble, is more common in the pregnant than the non-pregnant woman, owing to the increased vascularity of the uterine structures during gestation. It is a discharge of whitish, yellowish, or greenish mucus from the mucous lining of the vagina and uterus, especially from the glands located in the mucous membrane of the cervix uteri. The discharge may be slight or very copious.

It is usually unaccompanied by any very unpleasant symptoms, but occasionally the discharge is very acrid, and mixed with more or less purulent matter coming from parts of the mucous membrane abraded of its epithelium. When such is the case, the whole genital tract and vulva may be hot, swollen, and painful, sometimes connected with irritability of the neck of the bladder, and frequent desire to urinate. There may also be a growth of papillary projections on the mucous membrane occasionally as large as currants, but generally very minute, thus giving a granular appearance to small portions or the entire lining of the vagina, and is not unfrequently attended with intolerable itching of a part of, or the entire vagina and vulva.

In this aggravated form the affection is sometimes called vaginitis granulosa, and is often confounded with gonorrhœa or syphilis. The presence of condylomata and other specific signs, together with the history of the case, may assist the differential diagnosis. The practitioner must not forget the delicate nature of the subject and give a hasty diagnosis, for it may lead to family troubles even among the most innocent. I have known bitter quarrels between husband and wife from an ill-advised, hasty, and sometimes mercenary opinion given by an inexperienced, rash, careless, or unscrupulous physician. When in doubt, always give some inoffensive name to the complaint, and even sometimes when you know it to be venereal. There is an abundance of such epithets equally applicable to the non-specific and specific forms of vaginal inflammations.

Treatment.—Simple cases of leucorrhœa require only rest from sexual indulgence and an occasional vaginal injection of tepid water or decoction of slippery elm bark, marshmallow, or elder pith. The severer form demands a more energetic management, such as mild injections of the solutions of acetate of zinc, or lead,

alum, tannin, nitrate of silver, or sulphocarbolate of zinc. Of course more caution is necessary in the employment of vaginal douches during gestation than under opposite conditions, in order not to run the risk of producing abortion. Even warm water, if employed too frequently or forcibly, might result in this accident.

PRURITUS.—Allusion has already been made to this not unusual and most annoying condition of the genital canal as an occasional accompaniment of leucorrhœa. It may also arise from ascarides in the rectum, pediculi in the hairs of the labia and mons veneris, and obscure affections of the nerves. The itching is so terribly annoying as to cause the poor sufferer, in some instances, to use friction even when in the presence of friends, or when asleep. When seated in the vicinity of the clitoris, the almost constant titillation it occasionally gives rise to, completely ruins the poor victim's health, and sometimes ends in insanity.

The complaint is not confined to pregnancy, but is a little more frequent in that than in the non-pregnant condition.

TREATMENT.—If the malady arises during gestation it will generally disappear after the birth of the child. The medical man, however, is expected to cure it when called upon, as few women can tolerate the affection without being willing to use every possible mode of relief. Unfortunately, there are no sure remedies. When the disease depends upon ascarides, it is easy to cure it by removing the cause. Injections up the rectum of various preparations of aloes, quassia, asafœtida, carbolic acid, and common table salt, will answer the purpose. When arising from pediculi, a little mercurial ointment, or yellow wash, applied to the part twice daily, will be found serviceable. If it has its origin in leucorrhœa, the latter must be treated as previously directed.

Aside from these methods of treatment, the following formulæ will be found useful:

℞. Sodii boratis, ... ℥ij
Morphiæ muriatis, ... gr. xv
Acidi hydrocyanici diluti, ... fʒi
Glycerinæ, ... fʒi
Aquæ rosæ, ... fʒvi.

Misce. Ft. Sol. Sig.: Apply with a soft sponge or spray apparatus.

℞. Zinci sulphocarbolatis, ... ℥i
Aquæ destillatæ, ... fʒij.

Misce. Ft. Sol. Sig.: Apply every morning and night.

℞. Acidi carbolici, ... gr. vi
Morphiæ acetatis, ... gr. vii
Acidi hydrocyanici diluti, ... fʒiss.
Glycerinæ, ... fʒss.
Aquæ destillatæ, ... fʒiij–ʒiiss.

Misce. Ft. Sol. Sig.: Spray the vulva, or apply with a soft sponge.

℞. Sodi boratis, ... ʒij
Zinci oxidi, ... ʒiij
Morphiæ muriat., ... gr. x
Olei amygdalæ dulcis, ... fʒi
Adipis, ... ʒij.

Misce. Sig.: Apply to part three times daily.

If any excuse is necessary for this somewhat extensive notice of the treatment of a complaint almost ignored by obstetric writers, I must appeal to the real practical importance of the subject.

CHAPTER XV.

DISEASES OF PREGNANCY, CONTINUED.

PLETHORA, ANÆMIA, AND CHLOROSIS.—The pendulum of medical opinion has, within the last twenty-five years, swung from a belief of the essential presence of plethora in the pregnant woman, to anæmia, or chloro-anæmia, under a like condition. While, on the one hand, it is true that many of the symptoms accompanying pregnancy, such as ringing in the ears, vertigo, weight in the head, and somnolence, resemble those of plethora, and doubtless in many cases truly indicate it, yet a proper analysis of the blood shows in the larger proportion of pregnant women alterations in the relative proportion of its constituents more analogous to the blood of anæmia than plethora.

In the early part of gestation there is but little change in its constituents, but in the latter months, while there is a considerable increase in fibrin, the red corpuscles become greatly diminished. It would seem, therefore, improper to consider all pregnant women as being plethoric, as was formerly done, or of going to the opposite extreme, and looking upon their condition as one of anæmia.

The strong, robust woman, who is free from gastric disturbances, loss of sleep, loss of appetite, and lives freely upon rich food, and takes but little exercise, is very apt to represent the plethoric patient. On the other hand, the weakly woman, or the one who is a martyr to sympathetic disturbances of all kinds, particularly of the stomach, is almost sure to be in a state of chloro-anæmia.

TREATMENT.—The practical deduction from this view of the subject is that we must in our treatment aim to lessen a little the richness and quantity of the blood in the former, and tone it up in the latter. It was the custom a quarter of a century ago to treat plethora, even in the pregnant woman, by general bleeding. Many women were so strongly in favor of this method of treatment that they would not be satisfied unless they could, after the fifth month of pregnancy, be bled. If the family physician declined

to perform the operation, they could always find a "bleeder" outside of the regular profession. Phlebotomy is, however, no longer used for this, and rarely for any other, condition of the system.

When the woman is really plethoric we should allow her less rich food, give her more gentle exercise, and keep her bowels regular, when necessary, with saline purgatives, such as Rochelle or Epsom salts, Seidlitz powders, citrate of magnesia, or Tarrant's effervescent aperient.

If she be anæmic there is nothing better than one of the numerous preparations of iron, in moderate doses, either alone, or combined with small quantities of some of the active principles of Peruvian bark. Where the stomach is feeble, these remedies should be administered in the form of elixirs, such as Wyeth & Co.'s, Reed and Carnrick's, etc. Lactopeptin, pepsin, and bismuth, are often found useful additions to the above preparations when the digestion is very feeble.

Exercise, passive or otherwise, in the open air, and a suitable quantity of palatable and digestible food, are also indispensable requisites. Some advise wine, but the patient can generally do without it.

Constipation.—Pregnant women are particularly subject to constipation, owing in some cases to a deficiency of bile, but generally to pressure upon the bowels by the distended womb. In a few instances it may be due to defective innervation of the intestines, resulting from the uterine pressure, or a chloro-anæmic state of the system. If the bowels are not attended to, fecal accumulations, occasionally of an enormous size, occur, giving rise to spurious labor pains during gestation, and mechanical obstruction in labor.

Treatment.—The patient should, as a regular habit, go to stool two or three times daily, half an hour after meals, use as food various kinds of fruits, according to the season, oatmeal-porridge, brown bread, and such other articles of diet as have a tendency to keep the bowels regular. She may employ an occasional enema of water, soap and water, or olive oil and soapsuds; and when very costive a good cathartic enema of Epsom salts, compound fluid extract of sennæ and jalap, etc. She may drink a moderate quantity of Vichy, Frederickshall, Hunyadi, Püllna, or Apollinaris water every second, or third, or even every, morning. Of course when aperients will not answer, cathartics must occasion-

ally be administered, but the physician should bear in mind the tendency of harsh treatment to produce abortion.

The following prescription will be found very useful:

℞. Podophyllini, ... gr. iij
Ext. colocynth. comp., ... ℈j
Pulv. rhei, ... gr. xv
Olei anisi, ... gtt. iv

Misce. Divid. in pilulas xij. Sig.: One every nine hours until purged.

A regular cathartic like the above should not be administered very often. Once in two or three weeks, as a rule, would be frequent enough. In the meantime the changes could be rung on moderate doses of Rochelle salts, Murray's liquid magnesia, Seidlitz powders, solution of citrate of magnesia, the mineral waters, enemas already mentioned, and other mild means. Many women, however, by proper attention to diet, and the calls of nature, require no medicine whatever.

Diarrhœa.—An opposite condition of the bowels, or diarrhœa, may affect the pregnant, as well as the non-pregnant, woman. Its management, however, requires more care in the former than the latter, on account of its tendency, when severe, of exciting uterine pains, and leading to premature expulsion of the fœtus.

Treatment.—As looseness of bowels may exist with fecal accumulation, or have its origin in some indigestible food still in the prima via, it will sometimes be necessary to administer a cathartic previous to giving astringents. A few drops of laudanum, or a little morphia, or other anodyne, should generally be combined with it. After thus cleansing out the bowels, or without doing so if the emergency does not require it, one of the following formulæ or something similar may be tried:

℞. Opii, ... gr. vj
Camphoræ redactæ, ... gr. x

Misce. Div. in pil. or capsulas vj. Sig.: Take one every three or five hours.

℞. Bismuth. subcarbonatis, ... ℥ij
Calcis carb. precip., ... ℥ij
Kino, ... ℥ij
Tinct. opii, ... f℥iss.
Spiritus lavandulæ compos., ... f℥ij
Syr. acaciæ, ... f℥vss.

Misce. Sig.: Shake vial. Take a tablespoonful every three hours when passages are painful and frequent.

Or, ℞. Sodii bicarb., ... ℈ij
Tinct. opii, ... f℥ss.
Tinct. camphoræ, ... f℥ij
Syr. rhei aromat., ... f℥ss.
Aquæ cinnamomii, ... f℥ij, ℥vj.

Misce. Sig.: Shake vial. Take a teaspoonful every three, four, or five hours, according to frequency of stools.

Or, ℞. Misturæ cretæ, ... f℥iiss.
Ext. kramerian. fluidi, ... f℥ss.
Tinct. opii camph., ... f℥ss.

Misce. Sig.: Shake vial. A teaspoonful to be taken after every stool.

But it is unnecessary to multiply prescriptions, as there are numerous remedies at the command of the experienced physician, who must exercise great judgment in his treatment of severe forms of the complaint.

Ptyalism.—It would be hardly necessary to call attention to this occasionally annoying accompaniment of pregnancy, were it not that patients affected with it are very prone to imagine that their physician has administered to them some preparation of mercury. A quarter of a century ago he might have given as much of the latter as he deemed best, but he could not do so at present with impunity. Hence he must be prepared to defend himself against false accusations.

Treatment.—A solution of borax, alum, chlorate of potash, or a very dilute solution of chlorinated soda will be found useful.

Irritable Bladder.—The bladder, owing to its situation, is peculiarly liable to functional disturbance, or to irritation of its neck, accompanied by a frequent desire to urinate, from pressure of the pregnant womb, and sometimes from sympathetic irritation. It is most apt to be affected during the last fortnight of gestation, when the uterus has descended somewhat into the cavity of the pelvis; but it is also very liable to suffer from pressure during the third and fourth months of pregnancy, just before the rising of the womb out of the pelvis. During the first few weeks of pregnancy the irritation arises from sympathy only.

Treatment.—Anodyne suppositories up the vagina or rectum, ointments of lard, cosmoline, spermaceti, oil of sweet almonds, mixed with a salt of morphia, or sulphate of atropine, may often be used beneficially, but where it is caused by some abnormal position of the fœtus, rectification by external manipulation should be accomplished when practicable.

In the treatment it must be borne in mind that the frequent calls to micturate are not sure signs that the bladder is always nearly empty, for the same symptoms may accompany an over-distended organ, which can only be relieved by the passage of a catheter. This operation may have to be repeated several times daily for an indefinite period, or until labor has removed the pressure upon the neck of the bladder.

Spasmodic Cough.—Besides the ordinary diseases of respiration to which the non-pregnant and pregnant woman is equally liable, there is a very troublesome spasmodic cough, of sympathetic origin, which occasionally accompanies gestation. It not unfrequently resembles whooping-cough, and may be so violent as to excite abortion.

Treatment.—The bromide of potassium, or sodium, combined with the hydrate of chloral, or some preparation of opium, especially one of the salts of morphia, or with belladonna, will be found useful. In some cases conium, or hydrocyanic acid may be administered with advantage, or a few drops of ether or chloroform inhaled.

Dyspnœa.—This may be nervous and sympathetic in its origin and character, or it may arise from the upward pressure of the diaphragm by the growing fœtus. In the former case it is most likely to give trouble during the early months of pregnancy, in the latter when the uterus is largely distended.

Treatment.—Dr. Robert P. Harris, of Philadelphia, suggests that the patient's abdomen should be anointed, and that she sleep on an inclined plane with a pillow under her thighs and knees.

When the dyspnœa results from sympathetic irritation, one or more of the preparations just mentioned for spasmodic cough, may be tried, but when it originates from pressure it is more difficult to manage. Some alleviation may be found in so arranging the dress, particularly in removing or loosening tight stays or corsets, as to afford relief to diaphragmatic and encourage thoracic respiration. The falling down of the uterus, which generally occurs during the last two or three weeks of gestation, will so relieve the pressure against the diaphragm that the dyspnœa will disappear entirely.

Hemorrhoids, Varices.—It is a very common occurrence for women, during the latter months of pregnancy, to be troubled with a varicose condition of the veins in the lower part of the

rectum, constituting hemorrhoids or piles, and in the lower extremities, and vagina. This varicose condition is the ordinary result of pressure of the womb upon the hypogastric and iliac vessels, but hemorrhoids may also be produced by constipation. The veins occasionally become so distended as to burst. This accident is most likely to take place in the veins of the lower extremities and around the vulva. When it occurs in the latter, or in the cellular tissue surrounding the vagina, it receives the name of vaginal thrombus or hæmatocele, which will be discussed under the head of obstructions to labor, as the accident is most apt to occur during that period. The resulting hemorrhage from the bursting of the varicose veins of the limbs during gestation is hard to check and sometimes fatal.

TREATMENT.—Hemorrhoids may be benefited by a regular, gentle, and daily evacuation of the bowels. This may often be effected by regulation of the diet, and having stated periods after meals of going to stool. Mild aperients, however, are frequently necessary when there is much torpidity or sluggishness in the action of the bowels, such as Seidlitz powders, senna and manna tea, citrate of magnesia, Rochelle salts, Epsom salts, sulphur electuary, Tarrant's effervescent aperient, or any one of the mineral waters mentioned under the head of constipation.

English physicians are fond of prescribing castor oil. Aloes has usually been specially prohibited, but Dr. Fordyce Barker considers it, when combined with nux vomica, as particularly adapted to constipation complicated with the piles. When the latter protrude they should always, when possible, be gently returned, by first anointing them with cosmoline, vaseline, olive, or sweet almond oil, and applying proper pressure with the finger. One of the following ointments may be applied prior to their reduction, or subsequently, or when their return is impossible.

℞. Ung. gallæ cum opio, ... ℥i
Ext. stramonii, ... ℥i
℞. Pulv. opii, ... ℈ij
Acid tannici, ... ℥ss.
Vaseline, ... ℥i

One of the following suppositories, introduced into the rectum once or twice in the twenty-four hours, will often afford relief when the piles are swollen and painful:

℞. Extract. krameriæ, ... ʒi
Morphia sulph., ... gr. vi
Stearinæ, ... ℥ss.
Misce. Div. in suppos. x.

Or,

℞. Ext. opii, ... ʒss.
Ext. stramonii, ... ʒss.
Butyri cocæ, ... ℥ss.
Misce. Div. in suppos. xv.

An operation for a permanent cure during gestation is not admissible, but if the piles remain permanently protruded after the puerperal period, they may be excised, or cured by an occasional injection into their substance of a mixture of extract of ergot and carbolic acid in glycerin.

Mechanical support by an elastic stocking is all that is indicated for *varices* of the lower extremities, unless severe hemorrhage takes place, when lint or sponge, saturated with a solution of the persulphate of iron should be applied, supplemented by pressure upon the bleeding point if necessary. Varicose swellings around the vulva may be held in check by the moderate pressure of a soft pad kept in place by a T-bandage.

Hydramnios.—By this name is understood an excessive secretion of liquor amnii, or dropsy of the amnion. Although it is difficult to draw a line of demarcation between a normal and an abnormal quantity of liquor amnii, yet it is usual to consider three pints or more as belonging to the latter category. As much as five gallons of this fluid have been known to collect in the amniotic sac. Dropsy of the amnion is most frequent in twin pregnancies. It rarely shows itself prior to the fifth month of gestation. There are many theories as to its cause, none of which have been proved. It is believed by some to originate in inflammation of the amnion, by others in a pathological condition of the decidua, and by a third party in a constitutional syphilitic taint or a diseased condition of the fœtus.

In extreme cases of hydramnios the patient suffers greatly from embarrassed respiration, caused by the upward displacement of the diaphragm by the distended womb. Aside from discomforts arising from the pressure, the woman is seldom in bad health.

It is possible for extreme cases of dropsy of the amnion to end fatally to the mother by apnœa, but nature herself generally wards off this termination by the rupture of the membranes. Of course a premature expulsion of the fœtus is the result. In fact this accident is a common occurrence in cases of hydramnios.

When dropsy of the amnion and dropsy of the peritoneal cavity do not coexist, which, however, is the case occasionally, a differential diagnosis may be made between them, by observing the absence of some of the constitutional and local symptoms belonging to the latter—such as œdema of the genitals and lower limbs, thick and scanty urine, fever and continuous thirst, the superficial position of the fluid, and the difficulty of recognizing the contour or rounded form of the uterus. It is also necessary to differentiate between hydramnios and multiple pregnancy. This is attended with a great deal of difficulty and uncertainty. However, the inability of feeling the fœtal limbs through the abdomen, or the presenting part per vaginam, and the presence of fluctuation may aid in the diagnosis.

Treatment.—If the mother's life is threatened by an enormous distension we should imitate nature and rupture the membranes. Where it is possible to avoid this, especially when the fœtus is immature, it must of course be done, as expulsion of the fœtus is the necessary result. It has been supposed by some that a sufficient quantity of the amniotic fluid to relieve the woman might be drawn off by a fine aspirating needle without the production of abortion, but the suggestion has never been verified. Medicinal treatment is of no avail in this affection.

Hydrorrhœa Gravidarum.—This rare and very singular affection consists in a discharge of fluid from the uterus during gestation, at variable intervals, and in variable quantities, without any rupture of the membranes. Among the many theories of the source of this serous and commonly colorless discharge, I shall only call attention to the one generally adopted, which is that the affection springs from a secretion having its origin in the inner uterine surface, forming between the latter and the decidua a pouch which gradually increases in size until the fluid finds exit between the uterus and decidua.

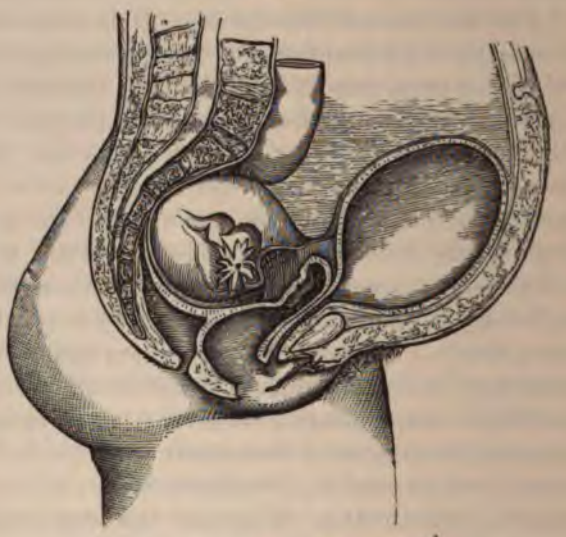
Treatment.—The trouble is hard to manage; but strict rest in the horizontal position and an occasional anodyne to relieve pain, are the only means usually found of service. Although the af-

fection may remit or intermit several times, it rarely disappears permanently until the expiration of pregnancy.

Displacements of the Gravid Uterus.—The womb may become displaced in the non-pregnant as well as in the pregnant woman, but displacement in the latter is sometimes more troublesome to manage, and always far more serious in its results when rectification becomes impossible, as is sometimes, but fortunately very rarely, the case.

The most common variety of displacement of the pregnant womb is retroversion (Fig. 62), which consists in a tilting backwards of

Fig. 62.



Retroversion about the Twelfth Week (Shultze).

the fundus uteri, and forwards, and sometimes upwards, of the cervix uteri, so that the mouth of the womb looks towards the symphysis pubis instead of the lower part of the hollow of the sacrum.

Etiology.—Retroversion may arise during pregnancy from the same causes that produce it prior to this condition, such as a fall, or undue distension of the bladder or rectum, or both of the latter conditions; but contrary to the old opinion, it may sometimes be due to conception having taken place in a previously retroverted or retroflexed womb. The generally acknowledged fact that con-

ception is not so apt to occur in a woman having retroversion or retroflexion of the uterus does not militate against this belief, because pregnancy happens sufficiently often under such conditions to account for a large proportion of these displacements in pregnancy. There probably are but a few accoucheurs in large practice who have never seen a case.

As pregnancy advances, the uterus generally straightens itself and rises above the brim of the pelvis without producing any great inconvenience. This spontaneous rectification is more apt to occur in recent displacements than in chronic ones, because there is less likely to be adhesions of the fundus to the surrounding tissues in the former, and there are more elasticity and strength in its normal supports than can be found in the latter variety. No matter whether a distension of the bladder or rectum be the primary cause of retroversion or not, it is sure to obstruct its spontaneous or artificial replacement.

The displacement in its turn, by causing the cervix uteri to press against the neck of the bladder, and the fundus against the rectum, aggravates the distension by rendering the evacuation of the bladder and bowels difficult and sometimes impossible.

Where retroversion is produced by a distended bladder and rectum, the former cause is brought into action before the latter, by pushing the fundus uteri against the rectum, which becoming obstructed by this external pressure, no longer permits a free passage of fecal matter, which accumulating above the fundus, has a tendency to force the latter still lower in the cavity of the pelvis.

If the unassisted or assisted womb fails to straighten itself and rise above the brim, a time is sure to come when from the enlargement and complications arising from pressure upon the pelvic organs nature or art must afford relief by abortion, or the woman will die from rupture of the bladder and consequent peritonitis from effusion of its contents, or from inflammation and sloughing of the womb itself, or some other sequelæ appertaining to such cases. Fortunately nature is usually equal to the emergency, and when she cannot cause the womb to assume its natural position above the brim at the proper time she causes the expulsion of the ovum. It is the duty of the medical attendant to render assistance in these formidable cases in the manner indicated under the head of treatment. A rare and curious feature of retroversion is

that pregnancy may advance to full term with the fundus in the pelvic cavity and the rest of the womb above the superior strait.

Symptoms.—The symptoms depend a great deal upon whether retroversion existed at the time of conception, or took place afterwards, gradually or suddenly. In the first of these cases we would not expect much change in the ordinary symptoms of chronic retroversion until pregnancy had advanced sufficiently far to cause considerable pressure upon the surrounding tissues and organs, especially the nerves, bloodvessels, rectum, and bladder. There would at first be an aggravation of the existing symptoms of chronic displacement, such as pain in the loins and deep down in the pelvis, and sometimes following the courses of the nerves, especially of the sciatic, down the lower extremities, with now and then pain and difficulty in evacuation of the bladder and bowels. So too when the displacement occurs slowly after impregnation.

In both of these cases, however, when the uterus becomes so large that there is no longer any room for it in the true pelvis, and yet does not straighten itself and rise above the brim, the symptoms assume a distressing and dangerous form.

If retroversion occurs suddenly about the second or third month of gestation, these symptoms manifest themselves as quickly. There will then be an irresistible and more or less constant desire for urination and defecation, accompanied by pain, difficulty, and sometimes an impossibility to perform these functions, owing to the pressure of the gravid and displaced uterus upon the neck of the bladder and the rectum.

Although a small quantity of urine or fæces may pass at each effort, the bladder and bowels may become enormously and dangerously distended. This fact is well known to the experienced physician, but might be overlooked by the careless and inexperienced, especially as the patient is almost always deceived and will inform her medical attendant that she has passed an abundance of water, when an examination may show the bladder almost ready to burst from overdistension.

Sometimes its tissues give way, and if death does not speedily follow from the shock, it will from the peritonitis resulting from the effusion of the urine into the peritoneal cavity. Although laceration of the viscus may not occur, cystitis sometimes does, causing an aggravation of suffering, or certain elements that are normally eliminated from the system by the kidneys and through the blad-

der, may be retained in the blood and the patient be carried off by uræmic convulsions.

In addition to other complications, if the uterus remain impacted and unable, either spontaneously or by assistance, to rise above the brim of the pelvis, the pains of abortion set in and temporarily intensify the patient's agony, although generally ending in her relief. This is always attended with hemorrhage, which may sometimes be excessive and dangerous. If the physician should see his patient for the first time under these circumstances he will not only witness the most graphic picture of suffering to which poor humanity is heir, but if he should never have seen a case of the kind he will be greatly perplexed on making a vaginal examination in comprehending its true nature.

On passing his finger in the normal direction of the vagina in order to reach the os uteri he will find it soon arrested by an elastic swelling along the posterior and superior border of the vagina, lessening and changing the course of the latter, and if pregnancy be advanced to the fourth or fifth month, completely filling the cavity of the lower or true pelvis. He will of course not find the os uteri in its normal position for the period of gestation, and may not discover it at all; but if he does, it will be behind or above the posterior or inner face of the symphysis pubis. I can imagine no more embarrassing situation than this for the tyro in medicine, and sometimes for his more experienced brother.

If it be possible to relieve the distension of the bladder and rectum, the symptoms may abate for awhile, but only to recur again and again, if the displacement should not be rectified, until nature or art affords relief by abortion. The symptoms are temporarily assuaged by the bursting of the bag of waters, preliminary to the final expulsion of the ovum. Even when the dislocation of the fundus is adjusted, the expulsion of the contents of the womb cannot be prevented after hemorrhage has occurred to a considerable extent, as it indicates an extensive separation of the ovular mass from the uterine tissues. When the womb straightens itself, as it sometimes does in these extreme cases, particularly after an evacuation of the bladder and rectum, or bursting of the membranes, the pains of abortion are far more endurable than where the retroverted organ struggles to expel its contents in the wrong direction—that is, against the neck of the bladder and symphysis pubis. Of course if the displacement becomes rectified

spontaneously, or otherwise, before the symptoms of abortion have fairly set in, gestation may continue to full term.

The general rule in regard to retroversion is, that rectification takes place before the termination of the fourth month of gestation; but this happy result is rare, where from any cause impaction of the womb takes place, complicated with obstinate distension of the bladder or rectum.

TREATMENT.—The chief object in treatment is to replace the dislocated fundus, and assist the uterus to rise above the brim of the pelvis when there is, owing to its increasing development, no longer convenient space for its growth in the lower pelvis. As a preliminary, the bladder and rectum should always, when possible, be evacuated; the former by means of an elastic male catheter, and the latter by an enema of soap and water, or some purgative solution or mixture.

An anæsthetic may or may not be used. It is generally desirable to employ it, especially where the pain is very great, and the muscles rigid and unelastic. It is, however, considered improper to do so when the patient is placed in the knee-elbow or knee-chest position. Although the woman may be placed in either of the ordinary obstetric positions, it is, in my opinion, better to let her assume the Sims's left lateral flexed position, or else the knee-breast position. The middle and index fingers of the right hand, properly warmed and anointed, should then be gently inserted into the vagina, with the palmar surface looking towards the sacrum in the former, and the reverse in the latter position, and carried onwards until their tips touch the fundus, against which gentle pressure should be made for some time upwards, and along one or the other sacro-iliac synchondrosis, so as to avoid the promontory of the sacrum. Where the fingers are too short, a piece of curved whalebone, with a small, soft sponge or cotton pad on the end, to be inserted in the vagina, may be advantageously used. It is not safe to employ much force.

Another plan is to put the patient under the full influence of chloroform or ether, and then pass two fingers, the whole hand, or a whalebone, padded at the end, into the rectum, and push up the fundus uteri; while two fingers of the other hand, passed per vaginam, hook down the cervix uteri.

I have, on several occasions, rectified retroversion of the uterus during pregnancy by simply hooking the index finger, or index

and middle fingers, over the cervix and drawing it downwards. In my first case of relief by this method, reposition occurred during my efforts at diagnosis. In this instance, the patient, a primipara, was taken with severe flooding and intense rhythmical pains, at about the middle of the fourth month of gestation. Upon a vaginal examination, I could feel the fundus uteri filling up the concavity of the sacrum, and almost the entire pelvic cavity. On searching high up behind and above the symphysis pubis, I finally, after much trouble, hooked my fingers on the cervix uteri, and, making a slight downward pressure, was surprised to find it yield and suddenly spring down into its normal position; the fundus, at the same time, bounding up above the brim of the pelvis, accompanied by instant temporary relief to the patient. But the symptoms of abortion had gone too far for the safety of the ovum, which was soon expelled.

In lieu of the above plans, or after they have been unsuccessfully tried, the following method should be adopted. Insert an oblong or ovoid rubber bag into the vagina, and distend it with air or water, the latter being preferable. This can be done by any one of the numerous syringes having a rubber ball for compression and a proper tube and nozzle, which can be inserted into a rubber tube attached to the rubber bag. The tube of the latter should have a stopcock so that the fluid may be retained or allowed to escape at pleasure. The bag should be kept continuously distended, except that the fluid may be permitted to run off about once every six hours, to free the pressure of the bag against the urethra, so that the woman may urinate, but so soon as she does, the bag must be refilled.

Constant and moderate compression against the fundus in this manner, is very apt to cause its ascent above the superior strait in the course of a few hours or days. After a reduction of the fundus and the elevation of the uterus above the brim, it is recommended by some authorities, particularly Playfair, that a large-sized Hodge pessary should be inserted and kept in the vagina until the womb becomes too large for another displacement. Others advise simple rest on the side, in a recumbent or horizontal position. In both plans it is necessary to see that the bowels and bladder are kept free from overdistension.

In cases where it is impossible to relieve distension of the bladder with a catheter, and yet there is reason to believe that the

fundus could be reduced if this could be accomplished, the medical man would be justified in drawing off the urine through the canula of a small aspirator needle, which should be inserted into the bladder through the anterior wall of the vagina, or just above the symphysis pubis.

When nothing else will afford relief, we are justified in adopting nature's course, by bringing on abortion. This is best done by puncturing the bag of waters. The escape of the liquor amnii may relieve the impacted womb sufficiently for readjustment, which will save the woman much suffering during the process of expelling the ovum. The puncture of the membranes may be made with a bougie, catheter, or curved probe.

It is not always practicable to reach the membranes through the cervix, and we are sometimes compelled to puncture them with the needle of an aspirator, or with a small trocar, through the walls of the uterus. This is generally best done through the vagina, but may be accomplished per rectum. In the latter case, the canula must be retained long enough to draw off all the liquor amnii, so as to prevent its extravasation into the cellular tissue.

Retroflexion.—The causes, symptoms, and treatment of retroflexion being the same as in retroversion, it is unnecessary to allude to it further than to inform the student that although the fundus is tilted downwards and backwards into the concavity of the sacrum, as in retroversion, the os uteri is not proportionally elevated behind the symphysis pubis, because the womb in retroflexion is flexed or bent on itself so as to bear a resemblance to a gourd, and is not straight with its long axis, as in retroversion.

Anteversion.—As the fundus of the pregnant uterus normally tilts more anteriorly than the non-pregnant, it becomes difficult to draw a line of demarcation between the normal and the pathological condition of this organ.

True anteversion in the early stages of pregnancy is very rare. It is the opposite condition to retroversion, the fundus tilting forward behind the symphysis pubis, and the cervix backwards and upwards towards the promontory of the sacrum.

An anteverted uterus rises up above the brim much more readily than a retroverted one, and consequently is not so apt to be incarcerated.

Under this head may be mentioned an extreme anteversion of the uterus, sometimes occurring in women who have borne chil-

dren, and who have very pendulous abdomens. The uterus in such cases falls forwards and downwards almost, or quite to the knees of the patient. It only takes place in advanced pregnancy, and is supposed by some authorities to be a hernia of the uterus between the recti muscles.

Causes.—Among the more prominent causes of anteversion may be mentioned straining, lifting heavy weights, and violent physical exertion of any kind.

Symptoms.—There is apt to be in anteversion great irritability of the bladder, dysuria, and sometimes complete retention of urine; also tenesmus and constipation. The diagnosis cannot be fully made out except by conjoined manipulation.

Treatment.—In some cases the anteverted uterus will rectify itself. Where it does not one or two fingers should be passed into the vagina against the fundus, which must be pressed upwards and backwards. Of course the rectum and bladder ought to be emptied prior to the operation. It is necessary that the patient should rest quietly in the dorsal position for at least several days after the replacement of the womb.

Anteflexion.—This is more rare than even anteversion, and differs from it only in having the womb bent upon itself. Cases like the one just mentioned, where the womb falls forwards and downwards almost or quite on a level with the knees, might properly come under the head of anteflexion.

Prolapse of the Uterus.—During the first three months of pregnancy the uterus nearly always descends somewhat lower in the pelvis than its natural site prior to conception. While a descent of this degree prior to pregnancy would be considered a falling or prolapse of the womb, it should not be called so during the early months of gestation. If, however, the cervix uteri almost rests on the floor of the pelvis, or protrudes partly through the vulva, it must be looked upon as a prolapse. If the womb falls outside of the vulva its condition is known by the name of procidentia uteri. The latter as well as the lesser degree of descent—prolapsus uteri—almost always occurs in patients having a slight form of falling of the womb prior to pregnancy.

Symptoms and Diagnosis.—These are dysuria, constipation, pains in the groins, loins, and a dragging-down sensation deep in the pelvic cavity; and when the uterus cannot rise up above the brim

before becoming impacted the symptoms assume a very serious aspect.

A digital examination determines the nature of the case; or in the event of procidentia the abnormal situation of the womb may be recognized by the sight.

TREATMENT.—As gestation advances into the second or third month a spontaneous reduction of the womb is apt to take place. Should it not, a careful manipulation will generally suffice to carry the organ above the brim of the pelvis. Sometimes the symptoms become so serious, when the uterus continues to develop in the cavity of the pelvis and cannot be carried above the brim, that premature expulsion of the ovum becomes necessary. When the womb hangs outside of the body and cannot be returned, pregnancy sometimes goes on to the full term. Under these circumstances a careful support of the organ by a bandage is highly important during the whole period of gestation. In ordinary cases of prolapse where the uterus, either spontaneously or by assistance, rises into the pelvis, rest for a while on the back is necessary until the womb becomes too large to descend into the pelvis again. In fact the recumbent posture, attention to the bladder and bowels, and moderate external support are necessary in all cases of falling of the womb during pregnancy.

CHAPTER XVI.

ABORTION AND PREMATURE LABOR.

THE normal course of pregnancy is very frequently arrested, and the embryo or fœtus expelled from the womb before the full term of gestation.

DISTINCTION.—The only distinction between abortion and premature labor is, that the former occurs before the period of viability of the fœtus, and the latter subsequently. Accordingly, if the expulsion of the fœtus occurs prior to the end of the seventh lunar month, abortion or miscarriage is said to have occurred; but if during the last three lunar months, but before the full term, premature labor.

Many writers limit the word abortion to the expulsion of the ovum during the first sixteen weeks of pregnancy, and the term miscarriage to the same event occurring during the middle period, or that between the end of the fourth and the end of the seventh lunar month, and premature labor to the expulsion of the fœtus in the interval between the latter time and the normal termination of gestation.

The classification first mentioned, or that giving but two periods is generally preferred by obstetricians of the present day on account of its simplicity, and because it is founded upon the basis of the viability and non-viability of the fœtus. It is true that the latter may be viable before the end of the seventh lunar month, but the rule is otherwise. Many authors consider the period of viability to commence at the end of six calendar months or one hundred and eighty days.

PERIOD OF EXPULSION AND FREQUENCY.—Premature expulsion of the embryo may occur at almost any period between conception and the full term of labor, but is much more frequent during the first three months than at any subsequent period.

IT IS MOST COMMON IN MULTIPARÆ.—Contrary to the statement of Tyler Smith and many other obstetric authors, premature expulsion of the fœtus occurs more frequently in multiparæ than in primiparæ. Schroeder says that "pluriparæ abort far more frequently than primiparæ (twenty-three pluriparæ to three primip-

aræ);" but then it must be borne in mind that a woman is only called a primipara at her first labor, and a pluripara at all succeeding accouchments. Still it is probably true as stated by Mr. Whitehead, that there are more abortions "at the third and fourth and subsequent pregnancies, and one or two of the last—those namely which occur near the termination of the fruitful period—than at the first or any other pregnancy."

It is estimated by Hegar that there is one premature expulsion of the embryo to every eight or ten deliveries at the full term of pregnancy. As this accident is very frequent and entails a vast amount of suffering and danger to the mother as well as a terrible loss of human life, it behooves the obstetrician to be thoroughly conversant with the subject.

It is usually stated that abortions are more frequent between the eighth and twelfth week. While this is true so far as it relates to cases brought under the observation of the physician, it is probably not correct in reality, for there are numerous cases about which the physician is never consulted, and many cases so closely resembling excessive menstruation that it would be difficult, if not impossible, to differentiate them. For instance, if the expulsion of the ovum occur within a few days or even weeks after conception there might be scarcely any more pain, hemorrhage, or other disturbance than would occur during menstruation, especially if somewhat delayed. The ovum being so exceedingly small at this period, it is doubtless frequently discharged in a clot of blood without being observed. Its size at the end of two weeks is about that of a pea. I think then we must agrée with Cazeaux in the opinion that abortions are much more frequent during the first two or three months than at any other period. The reason why this should be the case is, that the union between the chorion and decidua is at this period of a very lax character, readily permitting effusion of blood in the space between these membranes, thereby destroying in proportion to the hemorrhage the communication between the ovular and maternal tissues, and resulting in the death and expulsion of the ovum. An abortion is more apt to occur at what would be a catamenial period did pregnancy not exist.

Habit of Abortion.—A woman who has once aborted is more apt to abort again than one who has never met with this accident. And just in proportion to the number of her abortions is the difficulty of prevention in any given case. Perhaps in most of these cases pathological conditions of the decidua or the ovum itself may

be assigned as the cause, but there are many instances where we must ascribe the expulsion of the embryo to an inveterate habit of abortion.

ABORTIONS MOST DANGEROUS BETWEEN THE THIRD AND SIXTH MONTHS.—Until the formation of the placenta at some period in the third month the ovum in abortion is cast off *en masse*, leaving only the decidua to be expelled subsequently. The latter may come away in one piece or in shreds. After the formation of the placenta the amnion is ruptured by the contractions of the womb, and the embryo is generally expelled before the membranes and placenta. As the latter is more firmly adherent to the womb between the third and the sixth months, and may thus be retained for an indefinite period, the danger in abortion at this period from hemorrhage, septicæmia, and other puerperal pathological conditions, is greater than in the first two and a half or the last three months of gestation.

CAUSES.—In my remarks upon causes I shall make little or no distinction between abortion and premature labor, but shall use these mere technical terms synonymously.

The causes of abortion might be considered under the two heads of predisposing and exciting, allowing the former to embrace all those that simply render the abortion more apt to occur when the exciting causes are brought to bear upon the patient, but which are generally insufficient to produce this result without their aid.

Thus, any condition of the mother's health, or pathological state of the ovum itself, interfering with the vitality, nutrition, or growth of the latter, might act as a predisposition to abortion; while the exciting causes include all those agencies which directly determine the expulsion of the embryo, such as nervous, mental, and physical shocks, accidental or criminal injuries, etc. Or, I might, like Cazeaux, treat of the causes under the classes of those belonging to spontaneous, and those to accidental, abortion; or include them under the division of: 1st, causes which act directly on the uterus and induce contraction of this organ and expulsion of its contents; and, 2d, causes which primarily produce the death of the fœtus; but, for the sake of convenience, I shall discuss the subject under the classification of:

1*st. Causes referable to the ovum, including the fœtus and placenta;*
2*d. Causes referable to the mother; and*
3*d. Physical causes.*

Under the first or ovuline causes may be mentioned anything

which affects the healthy nutrition, growth, or vitality of the ovum, such as hemorrhage between its membranes, placental apoplexy, dropsy of the amnion, hydatidiform degeneration of the chorion, fleshy degeneration of the membranes, fatty degeneration of the chorion and placenta, calcareous or syphilitic degeneration of the placenta, induration, inflammation, and hypertrophy of the placenta, hydrorrhœa, and hydrocephalus.

Of all these diseases those of the placenta are perhaps the most common.

It is the belief of some authors that twisting or knotting of the cord either upon itself or around the neck of the fœtus may cause its death and consequent expulsion. The same results may follow any special pathological condition of the cord itself.

The length of time elapsing after the ovum, in any of its tissues, has become diseased, until its death and final expulsion, is exceedingly variable, depending of course upon the nature and extent of the pathological condition.

The time of expulsion of the fœtus even when dead is variable. It may be cast off immediately, or be retained in utero for weeks or months. It is said to be retained longer when it dies during the middle period than during the early and latter months of gestation.

Causes referable to the Mother.—We may include under this head hemorrhages in the cavity of the decidua, or between the decidua reflexa and decidua vera, hemorrhage between the latter and the uterine walls, congestion of the uterus, pelvic tumors of all kinds, deformities of the pelvis after about six and a half months, inflammation of the uterus, especially chronic inflammation of its mucous membrane, or excessive irritability of the uterus, inflammation of any of the abdominal or thoracic viscera, scarlet fever, small-pox, measles, convulsions, particularly those connected with albuminuria, diarrhœa, constipation, distension of the bladder by urine, etc.

Abortions sometimes have their origin in severe and sudden impressions made upon the nervous system of the mother, such as fright, sudden shocks, and the like. After the earthquake in San Francisco, California, July 3d, 1861, and the one in Portland, Oregon, November 30th, 1877, I saw and heard of several abortions resulting from this cause. A lady acquaintance of mine once aborted from fright produced by the sight of a dummy or stuffed

figure leaning against her doorway—it being placed there by some miscreant to frighten her servant girl.

When I was a medical officer of the United States Army, and stationed at Fort Yamhill, in Oregon, I was summoned to a distance to see a patient. On my arrival about midnight the messenger left me to find my way in the house, while he took care of the horses. Groping in the dark I at last found the door, and was leaning against it searching for the "string of the latch," when the barking of the dogs induced a lady inmate to suddenly open the door, causing me to fall inwards, thus frightening her so badly as to produce an abortion.

I once attended a lady in Portland, Oregon, for a miscarriage caused by the extraction of twenty-five teeth at one sitting, she being at the time five months advanced in pregnancy. I have also known of abortion being induced by the extraction of a single tooth. The extraction of teeth is recognized by most authorities as productive of premature expulsion of the ovum. Playfair, however, is not disposed to place much confidence in it. Abortion is apt to take place in women who indulge excessively in the use of alcoholic stimulants, the fatigues and pleasures of society, who live in ill-ventilated and overheated rooms.

Excessive coitus, especially near what would be, if pregnancy did not exist, a menstrual epoch, is not an unfrequent cause. Among constitutional diseases syphilis is one of the most constant causes of abortion. It may act in successive pregnancies until the disease is eradicated from the mother. In these cases the embryo is general affected through the blood of the mother, but the ovum may become diseased by the spermatozoa of a syphilitic father.

Women who become pregnant during lactation may abort from the irritation of suckling. Obstetricians have long been aware that the sympathy between the breasts and the womb is so great that it may be taken advantage of in the treatment of hemorrhage after delivery. The application of the child causes uterine contractions and consequently checks the flow of blood. It is thus easy to comprehend how suckling may lead to miscarriage. Contractions produced in this way are said to be brought about by reflex irritation which may arise from many other sources than the mammæ, especially the stomach and intestinal canal. Excessive vomiting, dysentery, intestinal worms and drastic ca-

thartics, may excite reflex action sufficient to produce premature expulsion of the ovum. So may stone in the bladder. Independently of these distal sources of irritation the womb may be excited into reflex action by the presence of a diseased or dead embryo or any foreign body in its cavity, or of a plug in the vagina, or by the alternate application of a stream of warm and cold water to the cervix uteri.

Ergot of rye, savin, borax and other oxytocics may produce abortion by their influence primarily upon the spinal cord, and secondarily upon the muscular tissue of the uterus. Malpositions or misplacements of the uterus may cause a premature expulsion of the embryo. The pregnant woman can experience no suffering more intense than is produced when a retroverted or retroflexed womb, containing a four or five months' fœtus, is prevented from rising above the brim of the pelvis. The accompanying pain is most agonizing. If a case of this kind is not relieved at all, or not relieved very soon, abortion is the inevitable result.

Physical Causes.—Every practitioner of experience must see many examples of abortions from falls—especially from a horse or carriage—from blows and other injuries. Yet it is most astonishing what some women may undergo in this way without the occurrence of any serious results. There are but few physicians who cannot recall instances of the most formidable injuries to the mother without any deleterious effects upon the fœtus. It is a lamentable fact that a very large proportion of abortions coming under the notice of the physician is produced by the patient herself—the medical attendant being only called in to control some dangerous symptoms, such as hemorrhage or inflammation arising therefrom.

In the majority of these cases the result has been brought about by puncturing of the membranes with a probe, catheter, bougie, or quill, or by forcible injections of fluids into the vagina, or the cervix uteri, or even into the uterine cavity itself. Sometimes this has been performed by the patient herself, but oftener by some abortionist, and the family physician been subsequently called in and kept in ignorance, as far as possible, of any criminal operation having been performed upon his unfortunate patient. But in many of these cases when death is impending a confession of the facts can easily be elicited by the attending physician if he so desires.

It would seem as though the law is almost powerless to prevent criminal abortion. Very few even of the most notorious abortionists are even properly punished for their wholesale slaughter of infantile life, and in not a few instances where they have been duly convicted and sent to the penitentiary, their sentences have been condoned by political influence, and they have subsequently plied their art more recklessly than ever.

Symptoms.—The two most prominent symptoms of threatened abortion are pain and hemorrhage. Either may at first be slight, the former recurring at regular intervals with a tendency to increase in frequency and strength until the ovum is expelled; the latter manifesting itself again and again more or less profusely, but generally with an increase in the quantity, until the womb has got rid of its contents.

The mere expulsion of the embryo does not mitigate the symptoms, which continue at intervals until the secundines are expelled. The pain is owing to contractions of the uterus, and the hemorrhage to laceration of the bloodvessels as a consequence of the separation of the membranes from the uterine walls. Pain may continue for a long time without hemorrhage, or the latter a long while without pain; and treatment may arrest the one without the supervention of the other, in which case expulsion of the ovum is not apt to occur. Either may take precedence in the order of occurrence. Either may be very slight or exceedingly severe at the commencement, though as a rule neither is severe at this period.

The seat of the pain is commonly the sacral, lumbar, and hypogastric regions, but it occasionally extends down the thighs and to the groins. It is sometimes in very early abortions so trifling that if the ovum be thrown off at a catamenial period it might be expelled without creating any suspicion of abortion, especially if the hemorrhage, as is apt to be the case, is also trifling in quantity. The expulsion sometimes occurs at the first menstrual period after conception, when it would be exceedingly difficult for the patient to know the true nature of the case, and occasionally a week or two after this period, when she might very naturally attribute any increase in pain or hemorrhage to delayed menstruation. This doubt might also obtain if impregnation occurred just before the last missed menstruation, and the hemorrhage, pain, and expulsion at the second catamenial period after

conception; for the symptoms might not be severer at this time than they occasionally are in the return of suppressed menstruation. The ovum would be so small that it could easily pass off unobserved, being mistaken perhaps for a clot of blood. After the second month of pregnancy, however, an experienced person could not well be deceived if sufficiently on her guard.

Sometimes the first symptoms of impending abortion are ushered in, or accompanied by a chilliness or rigor, which may be followed by more or less reaction, even amounting to fever. Again and again have I known inexperienced physicians under these circumstances to fancy they were contending with a congestive chill,—the great bugbear of malarious districts.

As a rule, the more advanced the pregnancy the more marked are the symptoms until the latter part of gestation. It is well to state before going further that, although I have recognized the technical division of the premature expulsion of the embryo into abortion and premature labor, no such distinction has been made in the enumeration of the causes, and none will be made in a description of the symptoms and the treatment. It may, however, be remarked that premature labor bears a greater resemblance to regular labor at term than it does to abortion. In a case of threatened abortion where either pain or hemorrhage is present alone, we may have hopes of being able to avert the expulsion of the ovum; but when these symptoms coexist, and especially if severe and of long continuance, there is very slight or no chance of this favorable result.

If the child perish, as it generally does previous to the severe uterine contractions which expel it, many of the symptoms of pregnancy, if present, cease, such as morning sickness, enlargement of the mammæ, and at a more advanced stage, fœtal pulsation, and ballottement of course, after the rupture of the membranes, which occurs before or during the act of expulsion.

The child is, however, sometimes born alive, particularly during the technical period of premature labor. When dead it is commonly soon expelled, but may be retained for an indefinite period. This is especially so in twin pregnancy, when it sometimes remains until full term, and thus is expelled together with a living, full-developed child.

If the membranes are unruptured, a dead embryo or fœtus may remain in the uterus several months without undergoing true

putrefaction. The latter change, however, takes place pretty soon after the breaking of the bag of waters. If abortion occurs before the formation of the placenta the whole ovum is generally expelled, as previously stated, at one time; but if it takes place subsequently the embryo may slip out first, leaving the secundines, which may or may not be expelled shortly afterwards.

They are sometimes retained for a long time, giving rise to more or less hemorrhage, which is occasionally fearfully profuse, or to symptoms of septicæmia, or to mole pregnancy.

The greatest danger in impending premature expulsion of the fœtus is of course from hemorrhage; and the danger after the expulsion of the embryo, but retention of the secundines, is from both hemorrhage and septicæmia. Flooding rarely occurs after the expulsion of the entire ovum. It is important to bear in mind that there may be hemorrhage internally for awhile between the ovum and uterus prior to its appearance per vaginam. This is apt to be the case where the bloodvessels at the fundus uteri are ruptured. When the blood comes from near the cervix uteri it usually escapes immediately.

The prominent symptoms of threatened abortion, hemorrhage, pain, and sometimes rigors, are usually preceded by a sense of languor, uneasiness, and weariness, with pain or aching in the lumbar region.

Diagnosis.—In regard to the diagnosis in a case of supposed threatened abortion, it becomes necessary to determine, first of all, whether or not pregnancy exists. It is not always very easy to do this in the early months of gestation, especially in a case where the patient may desire to conceal the truth, as of an unmarried woman, or woman long absent from her husband, or a widow after a certain time from the death of her husband. Of course, this question must be settled by a careful investigation as to the presence or absence of the symptoms and signs of pregnancy, which were discussed in a previous chapter. In this inquiry, it becomes necessary to differentiate the two most prominent symptoms of threatened abortion—pain and hemorrhage—from menorrhagia, metrorrhagia, dysmenorrhœa, polypoid and fibroid tumors, by a careful comparison of the symptoms of each. When we have fully concluded that pregnancy exists, the diagnosis of impending abortion no longer presents much difficulty. Uterine hemorrhage or pain alone would indicate it; when these symp-

toms coexist, the evidence is doubly strong, and when the bag of waters ruptures, abortion or premature labor must ensue, sooner or later.

In regard to the rupture of the membranes, it should be stated that, in the early months of pregnancy, it is no uncommon occurrence for the ovum to come away without this event taking place. I have in my collection, several specimens of this kind, where embryos, ranging from two to four months, may be seen floating in the liquor amnii, or the spirituous fluid of preservation which has, in a measure, replaced it.

A vaginal, conjoined with an external examination, is nearly always necessary in the diagnosis of abortion. This should be conducted with the utmost carefulness, or it will add to the danger of the case. If we have any doubts concerning the existence of pregnancy, conjoined manipulation enables us to clear them up, and at the same time to ascertain what effect the pain is producing upon the cervix uteri. If the cervix becomes alternately tense and relaxed from the pain, we know that the latter is uterine in its character. If, conjoined with this, the bag of waters assumes a tense and slightly projected form, somewhat like the convex side of a watch-crystal, we feel sure not only that abortion is threatened, but almost inevitable.

The amount of dilatation of the os tincæ assists not only in the diagnosis, but also in the prognosis.

The pain in abortion, subsequent to the third month and in premature labor, is often greater than in labor at full term. For, although in the latter case there is a larger body to be expelled, yet the cervix uteri has become expanded down to the os itself, so that the uterine contractions can be brought to bear on the dilatation of the os with much greater mechanical effect.

During the first two or three months of gestation, however, the pain, though usually pretty severe, is generally not so great as in premature expulsions of a later date, because the embryo is so small that a very great dilatation of the cervix uteri is not required to enable it to pass out. Premature labor during the last two weeks of pregnancy is, perhaps, attended with somewhat less suffering than labor at full term, for the reason that the cervix has become shortened, as in labor at term, and the fœtus is smaller, and thus likely to meet with less obstruction in passing through the pelvis.

Prognosis.—This depends upon the condition of the patient's general health, the means of taking care of her, the period of pregnancy, the cause of the abortion, and, above all, upon the amount of hemorrhage, and the danger of septicæmia and inflammatory complications from retention of a part or all of the secundines. If the abortion be caused by the mother's having small-pox, typhoid fever, pneumonia, measles, or scarlet fever, or from rude attempts to destroy the embryo by instruments, the prognosis is very bad. It is generally graver during the middle than the first and last periods of gestation. Ordinarily, however, it is the amount of hemorrhage that gives rise to the greatest danger to the mother; and the anxiety upon this point, as well as upon septicæmia and uterine inflammation, must continue until every portion of the secundines is expelled. In this connection it must be borne in mind that frequent miscarriages lead to chronic cervical and corporeal endometritis, to areolar hyperplasia (chronic metritis of the older authors), and hypertrophy of the uterus, and to chronic disorders of menstruation; which, more or less, seriously undermine the health of the patient.

Treatment.—The first point for consideration in the treatment of impending abortion is whether or not the expulsion of the embryo is inevitable. If there is a reasonable hope of prevention, of course our treatment should have that object in view; but when the hemorrhage is very great, and combined with severe rhythmical pains and considerable dilatation of the cervix uteri, miscarriage is unavoidable, and the indication is that the ovum should be expelled so soon as possible. Where the ovum is dead, efforts should also be made to encourage its discharge; but unless its presence in the womb gives rise to severe efforts of expulsion, great or prolonged hemorrhage, or septicæmia, or other dangerous symptoms, it is not necessary to resort to very hasty or energetic measures to get rid of it.

In those cases where miscarriage or premature labor is not inevitable, the most absolute rest on the back in the horrizontal position on a lounge or bed, with only clothing sufficient for comfort, should be enjoined. The room must be well ventilated and cool; the drinks cool, or at least, not hot, and unstimulating; the diet light and easy of assimilation. All excitement should be avoided.

If there be only moderate hemorrhage, unaccompanied by pain, we may administer suitable doses of acetate of lead, in solution,

with the addition of a little acetic acid to prevent decomposition of the lead salt in the stomach, gallic acid, diluted sulphuric, or aromatic sulphuric acid, and similar remedies. But where there is pain, the preparations of opium constitute the sheet-anchor of treatment. As pain in threatened abortion is synonymous with uterine contraction, many modern accoucheurs administer these preparations freely, even when no pain is present, with the object, if possible, of preventing its occurrence. I do not consider this good practice, as an inveterate habit of opium-eating might thus be engendered for a very doubtful benefit. There can be no doubt, however, of the usefulness of opium or its preparations when pain is present, either associated or not with hemorrhage. It must be freely given, and repeated as often as occasion requires, in the form of laudanum, Battley's sedative solution or in substance. Or, what is better, perhaps, the salts of its active alkaloid principles, especially the sulphate, muriate, or the acetate of morphia, should be given in appropriate doses. The tincture of opium or Battley's solution may be administered by the mouth, or, in proportionately larger doses, by enema. The salts of morphia can be used in these ways, or preferably, when the emergency is great, by hypodermic injection.

Chlorodine, in doses of fifteen to twenty minims every three or four hours, is also an admirable remedy. Astringents may, in cases of both hemorrhage and pain, be combined with the sedative remedies, although some modern authorities insist on their uselessness. Of course, the old remedy of bleeding from a vein in the arm is out of the question. Yet, a few authors advise, under certain circumstances, such as general plethora, or local uterine congestion, the application of leeches to the perineum, groins, arms, vulva, and other places in the vicinity of the womb. I consider the extraction of blood by any of these methods, not only useless, but more or less injurious.

Revulsives, such as dry cupping to the loins and other parts, are recommended by some writers; also the application of cold water, or vinegar and water, or of ice, per vaginam, or to the vulva, or hypogastrium. As these remedies are apt to excite reflex uterine contraction, they are deemed by many authorities not only useless but injurious in cases where expulsion of the ovum is not desirable.

In order to prevent constipation by the action of the opiates, an occasional aperient ought to be given. The tincture of Indian

hemp, in doses of five or six drops, every two, four, or six hours, has been recommended by Dr. Churchill for arresting the hemorrhage. Some have thought that the tincture of digitalis is useful for the same purpose. Dr. Burns, of Philadelphia, speaks highly of large doses of Fowler's solution. Chloral by the mouth and enema has been highly spoken of. I have but little confidence in the hæmostatic virtues of any of the four medicines last mentioned. Where the hemorrhage is very profuse and dangerous we must resort to the tampon, even though its use be followed by expulsion of the contents of the womb. This brings us to a consideration of the treatment.

WHERE ABORTION IS INEVITABLE.—When progressive dilatation of the os, profuse hemorrhage, violent uterine contractions, and discharge of the liquor amnii indicate the inevitable expulsion of the ovum, our treatment must have in view not only the checking of the hemorrhage and other alarming symptoms, but the facilitating of the expulsion itself.

Under these circumstances we should, if the discharge be dangerously profuse, administer ergot by the mouth, or preferably if the symptoms be urgent by hypodermic injection, and at the same time insert a tampon or plug into the vagina, saturated or not with some astringent or hæmostatic.

The tampon is variously made. Perhaps the best is an oblong india-rubber bag surrounded by a piece of spongio-piline. The bag has attached to it a long tube and stop-cock to regulate its inflation after insertion either by air or water, which is forced through the tube by a long rubber syringe like Hutchinson's or Davidson's.

The next best tampon consists of a number of dossils of cotton-wool, or preferably Lawton's absorbent cotton, with a string attached to each, and wrung out of slightly carbolized glycerin, and introduced one after the other into the vagina, either with or without the aid of the speculum. When removal becomes necessary the dossil inserted last should be removed first. Small pieces of fine surgical sponge, moistened with water or astringents, are useful, but cannot be retained over about six hours on account of becoming exceedingly fetid and offensive. Strips of cloth, especially cotton, are often successfully used in this way. So is a handkerchief inserted and filled with cotton-wool, strips of muslin, charpie, lint, or even fine tow. A roller bandage is very useful as a tampon, and has the advantage of easy introduction and removal,

as both operations are performed gradually and not by the whole roller being inserted or removed *en masse*. The speculum may or may not be used in the insertion of any of these plugs.

Almost any astringent or styptic solution in a proper state of dilution may be used to dampen the tampons if desirable, such as the liquor ferri perchloride, liquor ferri subsulphatis (Monsell's solution), alum or tannin dissolved in water, or glycerin and water.

It is generally recommended to make the tampon sufficiently large to fill the vagina to distension. But Shroeder deems this unnecessary and perhaps objectionable. He says: "The hemorrhage is most certainly stopped by pieces of lint which are pressed against the bleeding spot. They firmly adhere to it, and thus prevent any further bleeding. It is therefore unnecessary to fill up the whole vagina, and often a small tampon suffices to stop the most abundant hemorrhage. We have always had the best results from the following very easy way of applying the tampon. A speculum wide as possible is introduced into the vagina so as to get a full view of the bleeding cervix. Then a large piece of lint is evenly placed over the external opening of the speculum, and upon it other and smaller pieces of lint are placed so as to fill up the speculum to the bottom. While the tampon is pressed against the cervix with a long rod the speculum is withdrawn over it. There remains then within the vagina a closely packed tampon, contained in a sac of lint about the thickness of the speculum."

While a plug of sponge should not be permitted to remain in the vagina over six or eight hours, one consisting of any of the other materials specified and wrung out in slightly carbolized glycerin may be allowed to stay from twelve to twenty-four hours. On removal of the tampon if the hemorrhage recurs to any serious extent a fresh one ought to be introduced; and the use of this means should be continued so long as necessary. When the tampon interferes with urination it must of course be removed as often as two or three times daily.

It frequently happens that on removal of the plug the medical attendant finds the expelled ovum in the vagina. Or if the tampon is not retained *in situ* by a suitable bandage the pains or uterine contractions expel both it and the ovum together.

The tampon must be considered a valuable agent, but should not be used in cases where there are strong hopes of preventing a miscarriage, unless the hemorrhage is dangerous and unrestrainable

by other means. It is however an invaluable agent to check the discharge where abortion is inevitable. We should have but little fear of internal bleeding—at least up to the sixth month of gestation—during its use.

After the expulsion of the embryo, especially where the secundines, or a portion of them, are retained, ergot may be administered in the various ways previously mentioned. The plug may also be used under the latter circumstances during the early months of pregnancy, but not during the last few months, for fear of internal hemorrhage.

It is the retention of a part or all of the secundines that usually gives the physician the most anxiety. As already stated, the ovum in the early months of gestation is very apt to be expelled in a single mass; but after the formation of the placenta, or after the end of the third month, the embryo is liable, upon the rupture of the ovular membranes, to slip out with the liquor amnii, leaving the secundines behind. It is the duty of the physician, if present at this juncture, to introduce his finger as far into the womb as practicable, while he presses this organ down with the other hand on the abdomen, and hook out the placenta and membranes before the cervix contracts so closely as to prevent his doing so. If, however, he is not called in until this contraction has occurred, it is perhaps better for him to wait for the uterus to expel its contents, which may occur after a variable period of from a few hours to a few days or weeks, rather than undertake artificial dilatation. If however the symptoms become serious either by way of hemorrhage, septicæmia, or otherwise, dilatation by means of spongetents, sea-tangle, or laminaria, Tupelo dilators, Hunter or Barnes's or Molesworth's dilators, must be resorted to; and the secundines removed by placental forceps, or preferably by the finger. The uterus, in the latter case, being pressed down with the other hand on the abdomen.

In some cases where the ovum appears detached by a portion of it protruding from the cervix uteri, and is yet beyond the reach of the finger, chloroform may be administered, the whole hand introduced into the vagina, and a finger into the cavity of the uterus, when the retained parts may be extracted.

Professor A. R. Simpson's Method of Extracting the Ovum.—Professor Alexander Russell Simpson, of Edinburgh, in a late paper on "The Complete Evacuation of the Uterus after Abortion,"

recommends the patient to be put under anæsthesia, the uterus to be drawn down with a volsella, the ovum to be detached by the finger, and finally removed either with the latter or the placenta forceps. Although this treatment may occasionally be adopted, it seems unwise to use it, as the author would appear to advise, as a regular routine practice in cases of retained placenta.

As just stated, the uterus can generally be depressed with one hand upon the abdomen sufficiently for the finger of the other hand to extract the ovum when necessary without resorting to more dangerous manipulations.

After-Management.—The management of a woman after miscarriage is of more importance than is generally understood by patients, who are often unwilling to submit to the necessary care required to prevent subsequent evil effects. It is even the practice of many physicians to confine the patient to bed for only two or three days, and then to permit her to fully resume her ordinary duties. This practice is not usually followed by any immediate bad results, but eventually chronic menstrual and uterine disorders may too frequently be traced back to it. In ordinary and favorable cases the patient may be kept in bed or on a lounge only a few days, but she should avoid exercise and fatigue for several days subsequently.

If fragments of retained secundines cause hemorrhage it becomes necessary to keep her quiet until this difficulty has been overcome. When her general health has become seriously impaired, especially by the loss of blood, it is important to place her upon a tonic treatment, particularly chalybeate preparations, and to advise a change of air, tepid sea-baths, or a trip to some pleasant mountain or mineral spring.

Prophylactic Treatment.—Having discussed the treatment of impending and actual abortion it may be well in conclusion to consider in a general way what is called the prophylactic treatment, or that which is appropriate in cases predisposed to abortion, but not possessing any actual symptoms of the same. This treatment, aiming at the removal of all causes and morbid conditions tending to premature expulsion of the ovum, must of course be exceedingly variable. Among the diseases predisposing to the death of the fœtus and its final expulsion, none stand out more prominently than syphilis. If either or both parents be affected with the syphilitic taint he, she, or they must undergo a

thorough course of treatment for the same. It should also be borne in mind that this poison may affect the ovum for some time after the parent appears to be well. It is therefore recommended by some authors in cases where there are recurrent abortions, and one or both parents have had syphilis, to treat them not only in the absence of pregnancy, but to submit the mother to a course of treatment for syphilis at each successive impregnation, although she may be apparently cured of this disease.

It is unnecessary to go into details in regard to the treatment of syphilis in these cases. The same remedies with a few exceptions may be used in the pregnant as in the non-pregnant woman. Some practitioners depend mainly on the administration of the iodide of potassium, and others upon mercurial preparations, while a third party use both in combination.

In some cases it is useful to use mercurial fumigations, ointments, etc., in conjunction with internal treatment. It is no longer considered necessary, as formerly, to salivate the patient, but the system should be brought fairly under the influence of the medicine. For constitutional syphilis the following formula will be found useful:

℞. Potassi iodidi, ... ʒi
Hydrargyri chloridi corrosivi, ... grs. ij
Potassæ chloratis, ... ʒij
Syrupus simplicis,
Aqua anise, āā . . . . . fʒiv

Misce. Sig.: One or two teaspoonfuls after each meal.

In the treatment of some of the more obstinate forms of syphilitic eruptions the following combination will be found useful:

℞. Hydrargyri chloridi corrosivi, ... gr. i
Potassi iodidi, ... ʒss.
Liquoris potassæ arsenitis, ... ♏xxxvi
Alcoholis, ... fʒj
Syrupus simplicis, ... fʒiv
Extracti sarsaparillæ fluidi, ... fʒviij
Aquæ menthæ viridis, ... fʒiv

Misce. Ft. sol. Sig.: Take a tablespoonful three times daily after meals.

In the treatment of an anæmic and greatly debilitated woman, especially when not pregnant, the preparations of iron and quinine may be combined with some of the preparations of mercury.

In acute inflammation of the bowels, stomach, kidneys, bladder, liver and lungs, and in scarlet fever, measles, and small-pox, the probable occurrence of abortion must be borne in mind and extra precautions taken to relieve uterine hemorrhage and pain at their first manifestation.

When a patient has aborted several times in succession, or has acquired a habit of abortion, her case becomes more difficult to treat on that very account, independently of the real cause of the occurrence. If we can trace up the cause, efforts should of course be made to remove it. It may sometimes be due to chronic inflammation of the mucous membrane of the uterus, or to fatty degeneration of the chorion villi and other pathological states of the placenta, to irritation of the bladder, to albuminuria, to displacements of the womb, or in short to any one or more of a great many morbid conditions requiring, when ascertainable, special treatment of their own; yet aside from all these, extra caution is required when a bad habit of abortion is once fully established.

When the usual time approaches for the abortion we must do our best to keep the patient quiet, physically and mentally. Above all, sexual intercourse must absolutely be prohibited. If the time coincides with what would, if pregnancy did not exist, be a menstrual period, we should keep her quiet for about ten days or two weeks at least for several periods.

In some cases it becomes necessary to enjoin rest almost continuously for several months. In these cases we must be on our guard, or our patient may suffer more from the long confinement than she would by the allowance of moderate exercise in the open air occasionally. But few women can endure long confinement to the house, especially in bed or on a lounge, without becoming excessively irritable and debilitated—the worst possible condition for a woman subject to abortions or premature expulsion of the fœtus.

Strange to say, asafœtida, savin, and ergot, have been used by distinguished accoucheurs as anti-abortion remedies, with apparent beneficial effects. One would suppose that at least two of these drugs would lead to exactly an opposite result.

In chronic inflammation of the uterus and cervix during pregnancy we cannot apply to the same extent local caustics, vaginal injections, and baths, that might be applicable in a non-pregnant condition. Doctors Whitehead and Bennet, however, insist that

there should be no distinction in treatment between the pregnant and non-pregnant condition during the early months of gestation.

Displacements of the womb ought to be rectified. Some authorities recommend appropriate pessaries to keep the organ in place after adjustment until it rises above the brim of the pelvis, while others of equal authority reject this mode of treatment. The middle course between these opposing doctrines is probably the correct one, or that which allows pessaries to be used under certain circumstances and disallows them under others. The condition of the pelvic organs, for instance, in some patients permits without the least resistance the presence of pessaries in the vagina, while the great irritability of the same parts in others will not tolerate them for a moment.

CHAPTER XVII.

LABOR AND ITS PHENOMENA.

We have now to consider that great function of the uterine system called labor, which consists in the spontaneous or artificial expulsion of a fœtus and its appendages from the uterine cavity at term, or at the expiration of the average period of gestation.

Causes of Labor.—It must be admitted that although this subject has been repeatedly and ably discussed by physiologists from the earliest times, yet it is by no means settled. So that the best that a writer even at the present day, who does not desire to substitute mere theory for fact can do, is to summarize the principal theories. For the sake of convenience we shall place them under two classes,—fœtal and maternal causes.

Fœtal Causes.—The prevalent opinion among the ancients (and still held by the Chinese) was that the fœtus itself was the chief agent in effecting its liberation from the cavity of the womb, by an analogous process to that instinctively exercised by the chick in escaping from its egg-shell prison. Although physiologists of the present day look upon this as a fanciful theory, yet a few of them still believe that there may be some change in the fœtus at full term that tends to the separation of its maternal relations. The distinguished Dr. Barnes is disposed to think that a change occurs in the vascular system of the child. He says: "I rather incline to the opinion that when the fœtus has attained its full development, when its organs are prepared for external life, some change takes place in its circulation, which involves a correlative disturbance in the maternal circulation, which excites the attempt at labor."

The advocates of the fœtal theory lay great stress on the fact of dead children being expelled with more difficulty, and more slowly than living ones from the uterus; and also, upon the fact that the birth of a child occasionally occurs subsequently to the death of the mother. The opposers to this opinion assert that the living infant is expelled more rapidly and with less difficulty than the dead one, not by reason of the former being an active agent

of its expulsion, but because its movements irritate the uterus and thus produce more frequent and powerful contractions of this organ. In regard to the expulsion of a child after the death of the mother, it is asserted by Planque and others upon careful observations, that in these instances it will always be found that the former perished first, and was expelled by the contraction of the uterus, as the motor power of the latter is not so fully dependent upon the nervous system as to be abolished immediately on the loss of vitality of this system. Leroux, Osiander, and others have proved that the uterus retains the faculty of contraction for a short time after the cessation of vitality in the mother.

Maternal Causes.—The most prevalent and reasonable theory is that the fœtus is expelled by the contraction of the uterus, aided by that of the diaphragm and abdominal muscles. But this being granted, the question comes up as to the nature of the subsidiary or primary excitation that calls into action the contractility of the fibres of the muscles composing these parts. Why should this act so efficiently at one period more than another?

Distension of the Uterus.—Some authors would answer the foregoing question by stating that it is owing to the uterus reaching its acme of distension while the contained fœtus and appendages continue to grow. But this cannot be so, because as rapid and even greater distension occurs in multiple pregnancy before the full term of gestation, also in hydatidiform degeneration of the ovum, and in hydramnios, without the induction of contractions of the womb.

Tyler Smith's Hypothesis.—Tyler Smith ascribes the initiation of labor to ovarian influence, asserting that it always occurs at the menstrual epoch and from congestion of the ovaries then existing. But why should this condition of these organs produce contraction of the womb at the end of the tenth lunar month rather than at any other catamenial period? Tyler Smith, in reply, says in substance, for the same reason that the catamenial period is on the twenty-eighth instead of the fortieth or fiftieth day.

Sir James Simpson's Theory.—This theory, which has gained the assent of many accoucheurs, ascribes labor to the supposed fact that the separation of the ovum from its uterine connections occurs from fatty degeneration of the decidua, a process gradual in its nature but being always fully accomplished in about two hundred and eighty days, when the ovum is somewhat in the

position of a foreign body, and therefore naturally induces contraction of the uterus, resulting in expulsion of its contents. Dr. Robert Barnes objects to this theory, because in his opinion it fails to explain the ineffectual attempts at labor in extra-uterine pregnancy.

Playfair, while not fully accepting Simpson's theory, thinks Barnes's objection untenable for the reason that, although in extra-uterine gestation the uterus does not contain an ovum, it does contain a decidua, the degeneration of which might be sufficient to stimulate the abortive efforts at labor then witnessed.

Dr. Power's Theory.—This popular theory claims that uterine contractions at term are induced by reflex action caused by pressure of the presenting part of the child directly against the sphincter fibres of the cervix uteri after the gradual dilatation of the latter, so as to form a part of the uterine cavity.

The modern theory of the dilatation and obliteration of the cervix uteri being very different from that supposed by Power seriously militates against the latter's otherwise very plausible theory. As powerful objections can be urged against all these theories and hypotheses we must leave this intricate and interesting problem for future solution.

Expulsion of Fœtus Effected Mainly by the Uterus.—Although at certain stages of labor the diaphragm, the abdominal and other muscles assist the uterus, there is no doubt but the latter is the chief factor in expulsion, and capable of terminating labor without any subsidiary assistance whatever. Uterine contractions are not under the direct influence of volition. The latter may be suspended by chloroform without any disturbance of the former. Yet it must not be inferred that the will exercises no influence on parturition, for at the second stage of labor, when the abdominal muscles and diaphragm are called into action, the patient is capable of increasing the propulsive force materially by making a deep inspiration, then holding her breath, and *willing* the contraction of the abdominal muscles, which act with all the greater force in proportion to the fixedness of the diaphragm. Hence there is reason in telling the patient under these circumstances to hold her breath and bear down. But when the presenting part begins to distend the perineum to such an extent as to endanger its rupture, it is better for her to refrain from all vol-

untary efforts at bearing down, and to keep her mouth open, and even to cry out if she so desires.

The contraction of the womb may take place after death with sufficient force to cause delivery. These cases, which can only occur a short time after death, must not be confounded with those of fœtal expulsion several days after the demise of the mother, and which arise from pressure of gas, generated by decomposition, or perhaps from *rigor mortis*.

The first stage of labor is accomplished almost exclusively by the contractions of the uterus; the aid of the accessory muscles being brought into action after the completion of dilatation of the cervix uteri, when what is called "bearing-down pains" begin. It may be remarked here that the terms "pains" and "uterine contractions" are used synonymously.

Symptoms.—The phenomena preceding and attending labor may, for the want of a better term, be denominated symptoms. The first signs giving warning of the approaching event are of sufficient importance to be remembered, and are called:

Premonitory Symptoms.—The one most noticeable by the patient and her friends is an alteration in the position and form of the abdominal protuberance, caused by the settling down of the womb. This generally occurs during the last two or three weeks of pregnancy. The fundus uteri descends from the ensiform cartilage almost half way to the umbilicus and settles more anteriorly. The cervix also, containing usually the head of the fœtus, frequently becomes deeply sunk into the cavity of the pelvis, especially in primiparæ. The reason why this descent of the cervix is apt to be greater in primiparæ than in pluriparæ is that in the latter the fundus of the womb is more anteverted than in the former, on account of a more relaxed condition of the abdomen.

The descent of the womb permits a freer motion of respiration, and thus causes the patient to feel lighter, and in some cases more comfortable and more disposed to movement. In many instances, however, the comfort gained by the greater freedom of respiration is counterbalanced by the pressure of the fœtus against the bladder and rectum, as it settles down in the cavity of the pelvis, thus producing much distress from straining at stool, and difficulty in urinating and labor in walking.

The frequent passage of a small quantity of urine or of fæces under these circumstances does not prove that either the bladder

is, or bowels are, sufficiently evacuated. Dangerous accumulations in each of these receptacles may take place notwithstanding the numerous calls of nature are heeded by the patient. The over-distension of the bladder and bowels when neglected often results in spurious labor pains, and may prove a source of much discomfort and delay during the act of labor. A frequent desire to urinate is not only present in many cases as a preliminary to parturition, but continues during the whole of the first stage.

PAIN.—It will be remembered that there are moderate intermittent and usually painless contractions of the uterus during the latter half of pregnancy, and that some patients experience for a week or a month, or more, prior to parturition, at irregular intervals, and mostly at night, a good deal of pain in the uterus, unaccompanied, however, with dilatation of the cervix or any other symptom of labor. We have seen that the first kind of contractions are not peculiar to pregnancy, but may be present when the womb is enlarged by a tumor in its cavity.

The irregular and painful contractions sometimes annoy the patient exceedingly, causing her very frequently to fear that confinement is imminent. These pains are called false or spurious, and may be distinguished from the true pains by their irregularity, by often commencing very severely and becoming less and less, and dying out in a short time; and they are of limited extent, rarely dilate the os or protrude the bag of waters, and are not accompanied by the "show."

On the other hand, true pains commence in a mild form and are first felt in the back, extending gradually to the front, and become regularly longer, more intense and frequent, and dilate the os uteri, and protrude the bag of waters more and more at each recurrence. The duration of a true pain at first is usually momentary and the intermission is an hour or more. In the course of labor the duration increases to several minutes, while the interval is correspondingly shortened until it does not exceed a few minutes; and in some cases towards the last there is no intermission, but only a slight remission.

The false pains may arise from indigestion, cold, movements of the fœtus, and various other causes, and should, when severe, receive attention, or they might terminate in premature labor. Generally, quietude and rest, and an anodyne when necessary, will relieve them.

THE SHOW.—This precursory symptom is a more or less copious mucous discharge from the vagina and cervix, of variable consistence, sometimes quite thick, and occasionally containing, in addition to the ordinary vaginal secretions, lumps of a glairy vitreous appearance, tinged with blood. The latter is rarely found in it until labor has really set in, because it comes from the rupture of small vessels during the dilatation of the cervix uteri.

The show generally makes its appearance about twenty hours prior to, but may not until the commencement of, actual labor. The parts from which it flows become cushioned and soft. Its lubricating action upon the vaginal canal greatly facilitates labor.

DO THE PAINS COMMENCE IN THE FUNDUS OR CERVIX UTERI?—This is a disputed question. Wigand, Tyler Smith, Rigby, and others assert that the pains at the beginning of labor commence in the cervix and pass gradually upwards by a kind of peristaltic action, and afterwards return downward towards the os. This seems to be the favorite theory among authors.

Professor Lazarewitch, Meadows, and other authors take an opposite view, and declare that uterine action begins in the fundus and passes gradually downwards to the os uteri. Playfair also, though somewhat doubtful, inclines to the latter theory.

HOW IS DILATATION OF THE CERVIX UTERI EFFECTED?—The bag of waters is undoubtedly one factor in the dilatation of the cervix. It acts mechanically as a fluid wedge in forcing the latter open. But the longitudinal fibres of the uterus, which have an antagonistic action to the transverse fibres in the cervix, assist in the dilatation, as their contraction has a tendency to pull the cervix open and over the presenting part of the fœtus. These two forces, mechanical pressure of the bag of waters, or the presenting part of the child when the membranes happen to be ruptured, and muscular contraction, especially of the longitudinal fibres, have a tendency to gradually dilate the cervical canal until it is entirely taken up as a part of the great cavity containing the child; so that when labor commences there is no projecting cervix, but instead a cervix so distended and thin that it may sometimes be mistaken by an inexperienced physician for the membranes, especially when the os uteri lies far behind out of reach, and is only slightly opened; and when the same forces continue, but in a more active and rhythmical manner at the commencement of parturition, the os is gradually dilated sufficiently for the passage of the child.

The thick, spongy and soft os uteri is more dilatable than the one possessing the opposite condition of thinness.

Three Stages of Labor.—The majority of modern accoucheurs follow the example of Désormeaux, by dividing labor into three stages. The first stage extending from the beginning of true labor-pains until complete dilatation of the cervix uteri; the second fron the dilatation of the cervix to the expulsion of the child; the third from the birth of the latter to the expulsion of the placenta and membranes.

First Stage of Labor.—Although, in a few instances, labor may set in abruptly, with severe and quick-recurring pains, yet, as a rule, the latter are at first so feeble and far apart as to amount to nothing more than a little uneasiness, leaving the patient in doubt as to their true character.

They, however, become gradually stronger, and recur with more frequency until the poor woman forgets her promise of not complaining, and begins to ask, most imploringly, for aid and comfort. But females differ vastly in their natural sensibility to pain and in its endurance. While some will throw themselves about and scream out at every pain, others, undergoing the same agony, will endure it with the utmost stoicism. There are a few patients who possess such slight sensitiveness to pain, that they can pass through pretty hard labors without experiencing much suffering. But there is no greater agony than that felt by a sensitive person in difficult labor.

I have already stated that, in obstetric language, contraction of the uterus and pain are used synonymously, though strictly, they are not identical, for a patient may have a slight degree of the former, without the latter; and when both are present, as is almost always the case, they bear the relation of cause and effect,—the contraction producing the pain. It is often possible for a woman who has been in labor some time to recognize a beginning contraction of the uterus before she feels any pain. Under such circumstances she may exclaim, "Oh, dear! doctor, I am going to have another pain." But as there is no practical distinction between contractions and pains, I shall follow the usual custom of considering them identical.

The dilating pains, or those of the first stage, are sharp or cutting, and often harder to endure than the stronger propulsive pains of the second stage. They are variously located. Although

they may occasionally be confined to the back and hips, or the front part of the abdomen, they frequently extend from the loins and sacrum to the abdomen, hips, and thighs. Many women experience a nervous trembling at the commencement of each pain, especially towards the close of the second stage of labor, generally unaccompanied with coldness, and being a mere shake or tremor, and not a regular chill. Yet occasionally there is a sensation of coldness, and the surface of the body, especially the hands and feet, may feel cold to the medical attendant. When the patient feels really chilly and cold, the skin will usually seem warm to the hand of the physician. Although, in the great majority of patients, this nervousness is very slight, yet in a few, of a highly organized nervous temperament, it occasionally becomes so violent as to resemble a variety of convulsions. This is more particularly the case when the os is completely dilated, and the presenting part of the child is passing through it. Nausea and vomiting sometimes add greatly to the distress of the first stage. The shivering, nausea, and vomiting, when not too prolonged and exhaustive, are generally favorable symptoms, indicating the approach of the propulsive stage, but they are apt to create alarm with the friends and the patient.

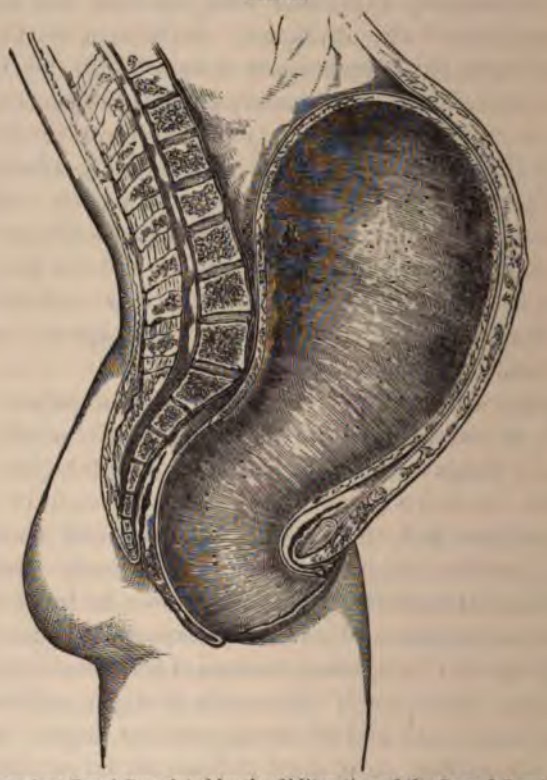
If a vaginal examination be made during a pain at the commencement of parturition, the membranes will be felt to become tense, and to bulge out in the shape of a watch-glass, in a head presentation, or, like a finger of a glove, in several of the abnormal presentations, and the os uteri will be found thinned at the edges and partially dilated. False pains rarely produce these effects. Many authors assert that they never do, but I think there are but few accoucheurs of extensive experience who have never been misled by this rule, when construed too absolutely.

At first, the dilatation of the cervix is slight, and may be only sufficient to admit the end of the physician's finger. It increases with each succeeding pain, until it becomes large enough to permit the passage of the presenting part of the child. Of course, the bag of waters protrudes more and more, until it breaks, or is ruptured by the attendant. The rupture generally takes place spontaneously by the time the cervix is fully dilated. If it does not, the attendant usually finds it advantageous to rupture it. A considerable portion of the liquor amnii flows away when the membranes are ruptured, but in cephalic presentations the head

frequently falls down on the os uteri, and, acting as a ball-valve, prevents the entire evacuation of the waters, which continue to flow in small quantities at intervals during the rest of parturition; but may not all pass off until the expulsion of the fœtus.

The pulse generally increases in frequency in proportion to the severity of each pain, and falls again in the interval. At the commencement of labor, in primiparæ, the os is found to be high up near the sacrum, but in ladies who have borne children it lies

FIG. 63.



Parturient Canal Completed by the Obliteration of the Os and Cervix.

nearer the os pubis. The first stage of labor, when unassisted, is generally completed in about six hours, but may last for a day or two. On the other hand, it is no uncommon occurrence for it to be over in an hour, or even less.

Although the membranes usually rupture during the first stage, particularly towards its termination, yet when unusually tough,

the fœtus may be born surrounded by them. It is, of course, the duty of the physician under these circumstances to puncture the bag and extract the child immediately. A fœtus thus expelled is said to be born with a "caul." Many superstitious people believe that a child thus born can never be drowned if he constantly wears about him the dried afterbirth. I have seen a few mothers rendered very unhappy by the nurse throwing away the placenta and membranes after a labor of this kind.

Second Stage of Labor.—At this stage the os can no longer be felt, it having been completely dilated and retracted over the presenting part, so as to form a single, continuous parturient canal with the vagina and uterine cavity (Fig. 63).

The pains now change from sharp and dilating to characteristic, propulsive or bearing-down efforts. Heretofore the progress of the child was entirely due to the contractile power of the uterus, but now the latter is assisted by the abdominal muscles. The pains become stronger and stronger, and the intervals shorter, but there is more perfect rest for the patient during the latter, and she bears the former with much more patience and fortitude than she did the sharp dilating pains of the first stage. The woman can now assist herself greatly by making a deep inspiration at each pain, thus filling her chest with air and then holding her breath so that the diaphragm will become a fixed point, when she should bring her abdominal muscles into action and bear down with all her strength. In fact she will do this instinctively to a certain extent. The effort will be more effective if she can have something against which to press her feet while she pulls by a towel or sheet, secured to the bedpost or foot of the bed, or has her hands held by assistants. As the presenting part is distending the perineum it sometimes becomes safer to advise the woman to call out during a pain, or else rupture of this part or even of the uterus might occur. Her cries are somewhat characteristic during the second stage, being no longer sharp and loud as in the first stage, but consisting of a succession of deep suppressed groans corresponding to a series of short expirations made during an effort at propulsion. Each pain causes the head to descend lower and lower, until it commences to press against and distend the perineum. The head advances and recedes as the pains come on and go off, but of course makes progress. The recession is a wise provision of nature to prevent a too rapid distension, and perhaps

rupture of the perineum. The rectum becomes flattened and its contents, if any, expelled by the pressure of the presenting part. As the perineum becomes greatly distended the anus opens an inch or more in diameter and the apex of the head gradually protrudes more and more through the vulva (Fig. 64).

Pain follows pain in rapid succession until the perineum and external labia become sufficiently distended to allow the expulsion, when during a prolonged and sharp pain and a scream, the head is born. The rest of the child may be expelled by the same

FIG. 64.

Distension of the Perineum (after Hunter).

pain, but generally there is a pause of a minute or more after the exit of the head, when the child is entirely born and the second stage completed.

Accompanying the expulsion of the child is a discharge of the remains, if any, of the liquor amnii, together with more or less clotted and liquid blood. In some cases of presentation of the head, the latter presses so closely and continuously against the cervix uteri, and subsequently against the inferior portion of the parturient canal, as to prevent the discharge of nearly all the liquor amnii, notwithstanding the rupture of the membranes, until the final expulsion of the fœtus, when the discharge is so immense that the physician may be alarmed, deeming his patient is flooding to death. An examination of the discharge will undeceive him, yet it is prudent to bear in mind that fearful hemorrhages do sometimes take place at this particular period. Vigi-

lance is therefore required of the attendant under such circumstances.

THIRD STAGE OF LABOR.—After the birth of the child the pains cease for awhile, and the woman expresses herself relieved. If it be her first confinement she may inquire if it be all over, or whether she will have any more severe pains. The womb immediately after the second stage is over will be found, if the hand be pressed low down in the hypogastric region, lying in the lower part of the abdominal cavity, contracted into a firm, rounded mass, about the size of a new-born baby's head. If the case be left to nature, after a repose of from ten to twenty minutes on an average, though it may extend to several hours, uterine pains again recur and expel the afterbirth completely, or into the vagina. When it lodges in the latter it is usually soon expelled therefrom, but may not be for a long time by the efforts of nature alone.

I have seen cases when no assistance could be had, where the placenta has been retained in the vaginal canal for a day or more.

FIG. 65.

Mode in which the Placenta is Naturally Expelled (after Duncan).

The pains of the third stage, or expulsion of the afterbirth, are of the same nature as those of the second stage of labor, but much lighter. A few successive contractions of the uterus are usually sufficient to effect a complete separation of the placenta from its internal surface and expulsion. In some cases the afterbirth is expelled simultaneously with the child, in other instances it is entirely detached from the internal surface of the womb by almost

painless retractions of the latter, and, after remaining as a foreign body for a short time, is expelled.

Baudelocque's description of the mechanism of the expulsion of the placenta, which has, until quite recently, been adopted by nearly all writers, holds that the amniotic or fœtal surface of this body is protruded first, and that it passes out of the womb and through the vagina in a state of inversion. That this is true when the cord is pulled upon seems quite evident, but where nature is left to take her own course, or is aided simply by abdominal pressure, it would appear that she adopts a different course. At least so say Lemser, Cazeaux, Dr. Mathews Duncan, Meadows, Leishman, Playfair, etc. According to this more modern view the placenta is not inverted, but passes out of the uterus edgewise, though it may be folded longitudinally upon itself (Fig. 65). When the afterbirth is drawn out by traction of the cord it becomes inverted, and acting like the piston of a pump, gives a tendency to hemorrhage. When it is expelled spontaneously, or pressed out by the hand being placed on the abdomen, it advances edgewise as previously asserted.

After-pains.—These arise from occasional contractions of the uterus after labor is over. Immediately after the passage of the placenta the womb may be felt as a firm, hard, globular body inside of the pelvic brim and extending about half way up to the umbilicus. It remains pretty firmly contracted, with occasional relaxations alternating with contractions for a day or two. The object of the contractions appears to be the expulsion of any clots that may form in the womb.

It is a singular fact that primiparæ are rarely troubled with after-pains, while pluriparæ almost always experience them more or less. They are not only very severe but last a long time with some women, while others suffer from them but very little.

Duration of Labor.—It is impossible to establish absolute rules in regard to the duration of parturition. It may be stated on an average of a large number of cases to be from eight to ten hours. But the duration varies not only in comparing different women with each other, but even the various births of the same woman, who may at one time be in labor for two or three days, and at another give birth to her child so suddenly that her medical adviser is unable to be present, even where no delay has occurred in securing his attendance.

Generally speaking, however, if a woman has a hard or an easy time once, the labor is pretty sure to be somewhat of the same character in the future. As a rule also she has a harder and longer time with her first child than subsequently. The younger the patient after the full development of the pelvis, the easier is her first labor, because the parturient canal is softer and more distensible than in after-life. Or conversely, the older a primipara the more tedious and difficult is her labor. This proposition is doubted by Playfair and a few other eminent accoucheurs. But my own experience fully convinces me of its truth. The various presentations and positions have a wonderful modifying influence over labor. For instance, other things being equal, it could not be expected that the occipito-posterior positions of the head would be as favorable for parturition as the occipito-anterior positions. And as to a cross presentation, or one of the shoulder, we would not anticipate a favorable termination without assistance.

In these desperate cases an unassisted favorable termination is almost impossible. It is true that a few cases are upon record of the child having been born by spontaneous evolution, or spontaneous expulsion; but it is presumable that in these cases the relative normal standard in the fœtal and maternal parts did not exist.

Various uterine and pelvic tumors, and various deformities of the pelvis, modify the duration of labor. So do the different degrees of rigidity of the cervix uteri. While the pelvic tissues of strong and muscular women offer more resistance to the progress of labor than those of a slighter formation, yet this is counterbalanced in a measure by the additional expulsive power of the womb and accessory muscles in the same individuals. Yet it is doubtless true as a rule that the thin, lax, non-vigorous patient, other things being equal, will have an easier time than the highly developed muscular woman.

But labor in women of the former class, particularly in the upper ranks of life, is often so influenced by nervous complications as to be rendered more difficult than would otherwise be the case.

Patients are apt to think that the obstetrician is able to tell the exact duration of labor, and will importune him upon the subject. He should be on his guard and rarely commit himself to predict a termination at a certain time. For even under the most favorable circumstances, when everything is progressing favorably, the pains may suddenly die away and not return for many hours, or

some other untoward event may occur to retard labor beyond the predicted period, to the annoyance of, and loss of confidence in, the medical attendant.

Where one can say to the suffering woman that everything is favorable, it is better to do so, but to her persistent inquiry, "Doctor, how soon will it be over?" it is better as a rule to reply that its duration depends upon so many circumstances, especially the frequency and strength of the pains, that it is impossible to state positively. Of course there are many cases where an experienced accoucheur can foretell the time of termination with a reasonable degree of certainty. The relative duration of the first to the second stage of labor is stated by some authors as two or three to one; while others believe that four or five to one is nearer the true proportion. Although the first stage is generally the longer, there are instances where it has been much shorter than the second.

CHAPTER XVIII.

DIAGNOSIS OF PRESENTATIONS AND POSITIONS OF THE FŒTUS.

BEFORE proceeding to describe the mechanism of labor it may be found convenient to consider the various methods at our command for diagnosing the presentations and positions of the fœtus prior to and during labor.

By knowing the presentation before the commencement of labor we may sometimes be able to correct it, when necessary, by external manipulation. To be unable to form a diagnosis after the beginning of parturition, is to grope in the dark, and trust to chance and nature for the safe delivery of the woman, without the ability of affording any intelligent assistance.

It is a little remarkable how few physicians in general practice ever study obstetric diagnosis with sufficient care to enable them to tell the precise position of a fœtus early in labor. If they can make out the presentation it is sufficient for their purpose. Until lately a diagnosis of presentation or position before the actual commencement of labor was rarely ever practical outside of Germany. The methods of diagnosis may be divided into the external, the internal, and the combined examination. The first and last modes of examination were almost entirely ignored by the profession, except in Germany, until within the last few years, but are now growing into favor.

DIAGNOSIS BY EXTERNAL EXAMINATION.—This includes inspection, percussion, palpation, and auscultation. As the subject of external examination so far as applicable to the diagnosis of pregnancy was discussed in Chapter X, it is unnecessary again to dilate upon it. I shall therefore omit inspection and percussion, and merely restate a few of the essential features of *palpation* and *auscultation*, as applicable to the *diagnosis* of the *presentations* and *positions just before*, and *during labor*. The woman should be placed on her back, with her shoulders elevated and thighs flexed, and when great accuracy is very desirable or essential, her abdomen should be uncovered, at least during the actual time of the examination. Her chemise and a sheet being arranged as described in Chapter X.

An exposure of the abdomen is very objectionable to many ladies, especially those in the higher walks of life.

It should be dispensed with whenever an exact diagnosis is not very necessary, as moderate accuracy is obtainable in palpation under a sheet or some other suitable covering; and thus also in immediate auscultation; but in mediate or instrumental auscultation it is generally necessary to bare the abdomen, as the rustling of clothing, unless it be unstarched cotton-cloth or muslin, is very objectionable. When the presenting part is low down, and the membranes ruptured, it is generally easy to diagnose the presentation and position by an internal examination alone; but before labor has commenced, or if commenced when the part presenting is beyond the reach of the examining finger, or the membranes are very tense and full of water, an external examination is absolutely necessary for a proper diagnosis of the case.

In Germany the younger members of the profession of the present day are more familiar with the method of external than of internal examination. In the United States and Great Britain the rule is the reverse. It would seem, however, that the careful accoucheur of any country ought in all doubtful cases at least to avail himself of both modes.

1. Palpation.—The physician, standing or sitting by the side of his patient, preferably the right side, places his hands—previously warmed—on her bare abdomen and moves them gently about, sometimes close together, at other times widely separated, and occasionally pressing lightly, and again firmly, endeavors to get the uterus and its contents between them. He may thus ascertain at first whether the fœtus lies crosswise or longitudinally in the uterus.

If the long axis of the child correspond to the long axis of the uterus he must next determine which of the fœtal poles is downwards, or the kind of presentation. He may do this by placing his hands upon the lower part of the woman's abdomen, one on each side, with the tips of the fingers directed downwards, and gently but firmly pressing the hands towards each other as if to make the fingers meet. He thus grasps between his hands the presenting part, and can usually determine its character.

He may also diagnose the presentation by firmly grasping the supra-pubic or hypogastric region with one hand, the thumb being placed on one side, and the fingers on the other,—the points of

the latter looking upwards or towards the woman's head. No undue force should be used in this manipulation. When the examination is made before labor, and it is not desirable to hasten the latter, we must suspend our operations during the contractions of the uterus, or altogether if premature labor is likely to be produced thereby. But when, whether prior to, or during labor, the contractions of the abdominal muscles interfere with the examination, they must be overcome by gently getting the muscles used to the presence of the hands and by directing the woman to keep her mouth open, or make long expirations at proper intervals, so that we may avail ourselves at such times of the muscular relaxation thereby produced to make the proper manipulations. If the presenting part be fixed in the upper strait it may be felt through the lower part of the womb, provided it has not entered very deeply.

Having palpated the lower segment of the uterus, we must next place our hands over the fundus with the tips of the fingers towards the mother's sternum, and make short tappings and pressure in every direction, but especially pressure of the tips of the fingers of each hand towards those of the other. To execute the latter movement it is necessary for the hands to be widely separated—one on each side of the abdomen.

Diagnosis of Head Presentation by Palpation.—In order to tell whether the presentation be the head or the breech we must bear in mind the characteristics of each. The hardness, roundness, and greater degree of ballottement of the former, the depression between it and the shoulder, and the absence of the prolongation of the thigh-bones, are sufficient to distinguish the head.

There is but little danger of mistaking the upper for the lower extremities, or the head for the breech, for the lower extremities are closely attached to the latter, while the upper extremities have between them and the head an interval—the neck.

There is occasionally some embarrassment arising from the fact that near the end of pregnancy, particularly in a primiparous woman, the whole head may have descended into the cavity of the pelvis. If the practitioner desires to make certain of the diagnosis in a case of this kind he must pass the ends of his fingers deeply down towards the cavity of the pelvis, and he will discover the latter filled with the presenting head.

Diagnosis of Positions by Palpation in Head Presentation.—The practitioner having made out the presentation can deter-

mine the position by first finding to which side the back of the fœtus is turned. The back may be distinguished from the abdomen by its greater hardness, and the absence of anything like the limbs of the child lying along or across it. The upper limbs generally lie so close to the body that they, except under very favorable conditions, such as great thinness and relaxation of the natural abdominal walls, are hardly even palpable; but the lower extremities are distinguishable except in very fat patients, or those with rigid abdomens or contracted uteri, or others with an excessive quantity of liquor amnii.

If then the head presents and the back of the child is turned towards the left side of the mother, we know that the position is either the first, or left occipito-anterior, or the fourth, the left occipito-posterior. As the latter is so rare, the position might be declared to be the first without further manipulation; yet if absolute certainty be required we must endeavor to find whether the back points to the left and anteriorly or to the left and posteriorly.

If the back of the child is turned towards the right side of the mother the position is either the second—right occipito-anterior—or the third—right occipito-posterior—the latter, if the back looks somewhat posteriorly, and the former when it looks a little anteriorly.

Diagnosis of Face Presentations by Palpation.—It was formerly considered impossible to diagnose a face presentation by palpation alone, but it has lately been discovered that this may be done. The hands must be placed with the fingers pointing towards the cavity of the pelvis, and after a proper manipulation, a hard, smooth, convex surface will be discovered on one side of the uterus, corresponding to the forehead of the child, and on the other side an indistinct, irregular, and soft surface may be felt, corresponding to the chin, neck, and thorax. Between these points we know the face must be presenting.

Diagnosis of Transverse Presentations and Positions by Palpation.—If, by palpation, we discover the fundus uteri empty, and can easily pass a hand between the lower part of the uterus and symphysis pubis, while a large movable part is found in each side of the uterus, we may conclude that the case is a transverse presentation.

There are two divisions of the latter,—the dorso-anterior, where the back of the fœtus looks forward, and the dorso-posterior,

where the back looks posteriorly; and two subdivisions or positions of each of these presentations, depending upon whether the head be in the left or right iliac fossa They may all be determined by palpation, which is often our only reliance.

2. Diagnosis by Auscultation.—This must be used with great caution, as an aid in the differential diagnosis between the breech and the head, and, perhaps, of a face from a vertex presentation, but is more useful in the diagnosis between the different positions of the head and breech.

The site of the pulsation-sounds of the fœtal heart in head presentations, is generally below, and in breech presentations above the umbilicus, either to the left or right, according to the side to which the fœtal back is turned, and are more audible in the dorso-anterior position of the breech, and the occipito-anterior of the head, than in the posterior fœtal positions of these parts.

The sounds in all the presentations and positions are only audible over a small space of about two or three inches. In the first position of the head or left occipito-anterior position, the fœtal heart is heard to beat with the most distinctness in the left lower region of the abdomen, a little to the outer side, about midway between the left anterior-superior spine of the ilium and the umbilicus, but occasionally near the middle line. In the second, or right occipito-anterior position, the sounds are most audible on the right side, close to the middle line of the abdomen, and occasionally a little to the left of this line.

Where it is possible, the middle line of the uterus should be taken as the limiting line instead of the linea alba, or one might be deceived in cases of lateral deviation of the uterus.

In the third, or right occipito-posterior position, the sounds of the fœtal heart are heard most clearly on the posterior part of the right side of the abdomen. In the fourth, or left occipito-posterior position, they are most audible on the posterior part of the left side of the abdomen. It is more convenient, however, to listen to them from the front, but they are then heard with much less distinctness than in the two occipito-anterior positions, because they have to pass through the thorax instead of the back of the child.

These facts may be better understood when we bear in mind that the lungs and the heart of the fœtus are flattened against its vertebral column, and that, therefore, the heart pulsations are

best transmitted through its dorsal region, which, being placed to the left and in front in the first position, to the right and in front in the second, to the right and posteriorly in the third, to the left and posteriorly in the fourth position, the fœtal sounds must be heard with the most distinctness in the first two positions.

In distinguishing between the face and vertex presentations, auscultation may render some assistance, if it be borne in mind that in the first position of the face, forehead to the left foramen ovale, and the chin to the right sacro-iliac synchondrosis, the fœtal heart is heard on the right side of the abdomen, instead of the left, as in vertex presentations; and that, in the second position of the face, where the forehead looks to the right foramen ovale, the fœtal pulsation is heard best on the left side. This is the fact until the face has descended low down into the cavity of the pelvis, and rotation of the chin has taken place. The reason of this difference between corresponding positions of the *vertex* and *face*, is that in the latter the fœtal sounds are best transmitted through the sternum, rather than the dorsum of the fœtus, as in a vertex presentation.

Diagnosis of Presentations by Internal Examination.—The woman may lie on her back or her left side, near the edge of the bed with her lower extremities properly flexed and thighs abducted, and the accoucheur seating himself by the side of the bed opposite the patient's hips, carries his right hand—though he may use his left—under the bedclothes, and, if the woman is on her back, beneath her right thigh, and gently inserts the index finger, previously lubricated with lard, sweet oil, vaseline, or cosmoline, into the vagina. If he does not reach the whole of the presenting part, he should introduce both the index and middle fingers. If he finds his patient lying on her right side near the edge of the bed, and, owing to the small size of the room or other causes, it be impossible to place her on her left side without reversing her position in bed, which is not always convenient or possible, he may use the fingers of the left hand in the examination. If the latter be made during labor, it is generally recommended to introduce the finger during a pain, but in this matter the accoucheur ought to be guided by the convenience of himself and patient.

Whether the introduction be made during, or in the absence of a pain, the examination must be extended through both interval and pain.

Prior to or at the commencement of labor the practitioner may generally diagnose by an internal examination a head presentation when existing, but can hardly ever make out definitely the other presentations, or the precise position, until labor has advanced sufficiently far to cause at least moderate dilatation of the os uteri. When the presenting part is low down and the membranes flaccid or ruptured, and the os well dilated, a physician of experience ought to be able to obtain a precise diagnosis.

In general terms it may be stated that the *head* may be diagnosed by its sutures, fontanelles, and hardness; the *breech* by its softness, by the buttocks and the cleft between them, the os coccygis, the anus, the vulva, or scrotum; the *knee* by its roundness and the femoral condyles; the *foot* by its being at right angles with the leg, the nearly equal length of the toes, and there being no unequal projections as in the fingers to a regular line drawn from the tip of the large to the tip of the small toe, and by the narrow heel; the *hand* by the absence of any angularity with the arm, by its shortness, by the unequal length of the fingers, and the separation of the thumb from the fingers, and the ability of its being placed on the palmar surface of the hand in apposition to any one of the fingers; the *elbow* by the sharpness of its olecranon process in comparison to the knee; the *face* by the nose, mouth, chin, the eyes, especially the supra-orbital margins of the os frontis, and the alveolar process of the mouth; the *shoulder* by its being a round, smooth prominence, with a depression at its side (the hollow of the axilla), the sharp edge of the acromion above, and when it is possible to touch them, the clavicle, ribs, and intercostal spaces.

Differential Diagnosis.—When the *breech* and *face* are much swollen they might be mistaken for each other. For instance, the cheeks for the nates, the nose for the genitals or coccyx, the mouth for the anus. If we can make out the hard alveolar process of the mouth, and the bony orbital ridges of the frontal bones, we may know that it is the face that presents.

The absence of the femoral appendages to the pelvis, especially of the two trochanters, and the rough projecting prominence of the sacrum, will assist in excluding the breech. While the presence of the last two features, and others less characteristic, and the absence of the areolar ridges and orbital arches, will enable us to diagnose a breech presentation.

The *knee* may be distinguished from the *heel* by having two

tuberosities instead of only one; from the elbow by the latter having one sharp central prominence, the olecranon process with a depression in the centre and a tuberosity on each side; and from the *shoulder* by the latter having a round, smooth prominence, with the axillary depression at its side, the sharp acromion process above, and having in its vicinity the clavicle, ribs, and intercostal spaces.

The *foot* may be diagnosed from the hand by its right angular position with the leg by the characteristic projection of the calcaneum, unlike anything in the hand; by the toes being shorter than the fingers, and all in a line; by the great toe not being separated as much from the other toes as the thumb from the fingers, and the impossibility of bringing it in apposition to the other toes like the thumb may be with the fingers; by the internal border of the foot being much thicker than the external, while the two borders of the hand are of the same thickness.*

Diagnosis of Position of the Head by Internal Examination.—Supposing that a vertex presentation is ascertained, but we desire to find out the position, the first step is to determine the direction of the sagittal suture, and if it be found to run in the right oblique diameter of the pelvis, the position must be either the left occipito-anterior or the right occipito-posterior; but if, on the contrary, it be found running parallel with the left oblique diameter of the pelvis, we know the position is either the right occipito-anterior, or the left occipito-posterior.

Having determined in which oblique diameter the head lies, we next find out whether the occiput is forwards or backwards, which can be done by discovering which fontanelle is forwards or backwards, or whether the free portion of the concha of the ear points backwards or forwards, bearing in mind that it always points towards the occiput, and we have completed the diagnosis. The fontanelles may generally be distinguished by their shape and size. Great pressure, however, sometimes not only greatly diminishes the anterior fontanelle, but even causes it to disappear. When the apex of the occipital bone is pushed beneath the parietal bones the posterior fontanelle may resemble a mere deficiency of the bone. Hence it would be difficult under these circumstances to tell one fontanelle from the other, or either from an abnormal fissure or opening sometimes found in the fœtal cranium. Yet, as a rule, the anterior fontanelle will be recognized by its large size and lozenge shape, and by its being formed by the junction of the

frontal, sagittal, and two halves of the coronal sutures, and the posterior by its smaller size, triangular shape, and by its being formed by the junction of the two legs of the lambdoidal and the sagittal suture.

The sagittal might be mistaken for one of the lambdoidal sutures; but this error may be avoided by remembering that the latter is convex and the former straight. Even when the compression of the parietal bones is so great as to form with each other an acute angle the sagittal suture preserves its straight course. We may also be helped to recognize the sutures by remembering that the superior angle of the occipital bone is nearly always pushed beneath the parietal bones. When the caput succedaneum is so large as to cause the presenting portion of the head to feel soft to the touch, the cranial bones may be felt by passing up the finger immediately behind the symphysis pubis.

Diagnosis of the Positions of the Face by Internal Examination.—It is usually an easy matter to diagnose the position of the face after the presentation has been discovered by observing in what direction the nostrils look, as they must point to the part of the pelvis which corresponds to the chin.

The Position in Breech Presentations.—Having ascertained the presentation to be the breech, we must find out in what direction the tip of the coccyx points, and we may generally diagnose the position, for it always points in an opposite direction from the fœtal back.

Diagnosis of Positions in Transverse or Shoulder Presentations by Internal Examination.—It is sometimes important that we should not only recognize a transverse or shoulder presentation before or early in labor, but the exact position in which the child lies. This may be done, as previously stated, by palpation, which is often our only recourse, especially before labor, or even during labor before the os uteri is dilated, and in all cases where the presenting part is too high to be reached by the examining finger. Still, in many cases, especially after pretty complete dilatation of the os uteri, we may make a complete diagnosis by an internal examination.

By remembering that the spine of the scapula corresponds to the back, and the clavicle to the abdomen, of the fœtus, we may determine whether there be a dorso-anterior or a dorso-posterior presentation, and by knowing that the axilla of the child always

looks to its feet, we may diagnose the two subdivisions or positions of each presentation by ascertaining whether the axilla points to the left or right, as the head must always occupy the iliac fossa of the side opposite to which the axilla looks.

If the practitioner cannot make out the exact position in this way he may bring down the arm carefully, provided the membranes are ruptured, and taking hold of the hand with his right hand as he would in shaking hands, if the palm lie in the palm of his hand, and the thumb be in apposition to his thumb, he may know that the presenting part is the right hand, but if the back of the child's lies in the palm of the physician's hand while the thumbs are in apposition, the presentation must be the left hand.

If we are sure the presenting hand is in a state of supination we know that its back must correspond with the back of the child, and its palm to the latter's abdomen, its little finger to the feet, its thumb to its head. Of course the hand should never be brought down except as a *dernier ressort;* it is liable to be injured, and always renders turning a little more difficult when brought down.

The Combined Examination.—Although previous to, and sometimes in the earliest stage of labor, especially in cross presentations, we may be compelled to rely upon the external examination, and on the other hand may nearly always in a somewhat advanced stage of labor be able to make out a diagnosis by an internal examination of the presentation and position, particularly in presentations of the head, yet both methods of examination are frequently useful, and sometimes absolutely essential. I presume that there are not many experienced accoucheurs who do not, to some extent at least, avail themselves of both methods, either separately or more or less conjointly.

CHAPTER XIX.

MECHANISM OF LABOR IN HEAD PRESENTATIONS.

Before entering into the study of the mechanism proper of head presentation we shall consider its *causes* and *diagnosis*.

Causes of Head Presentation.—This is one of the unsettled points in obstetrics. Some ascribe it to gravitation, the head presenting because it is the heaviest part of the child's body; others to the mode in which the uterus is developed during the latter part of gestation; others to certain movements of the fœtus of a reflex or an excito-motory character.

Diagnosis.—Having devoted a chapter to the diagnosis of the various presentations and positions of the fœtus during labor, it is unnecessary to go over the whole subject again, so I shall only call attention to the chief diagnostic points in a presentation of the vertex and its positions. We may call to our aid three kinds of examination, the *vaginal touch*, *palpation of the abdomen*, and *auscultation*. But as diagnosis by the first method is generally so easy and certain it is rarely necessary to resort to the other methods. The head may be readily recognized by its hardness, roundness, fontanelles, and sutures. As it rests almost without the intervention of any liquor amnii on the walls of the uterus, there is usually no difficulty in diagnosing it during the latter months of pregnancy, and especially at term, through the parietes even prior to any dilatation of the os uteri.

When the latter in labor is dilated sufficiently for the insertion of the finger, the rounded, smooth, and resistant surface of the fœtal head is easily made out. Having thus ascertained the presentation we next endeavor to find out the position by tracing the directions of the sutures and fontanelles. If we find the sagittal suture lying in the right oblique diameter with the posterior fontanelle looking towards the left foramen ovale, we recognize the first, or left occipito-anterior position of the vertex; but if the posterior fontanelle is pointing towards the right sacro-iliac synchondrosis the position must be the third, or the right occipito-posterior. If, however, the sagittal suture lies parallel to the left

oblique diameter of the pelvis, the position must be either the second, the right occipito-anterior, or the fourth, the left occipito-posterior, depending upon whether the posterior fontanelle looks towards the right foramen ovale, or the left sacro-iliac synchondrosis.

In the *toucher* it is usually best to press upon the abdomen with one hand over the uterus, while the finger of the other is inserted within the vagina.

PALPATION.—When the diagnosis cannot be fully determined by the vaginal touch, or when for any reason the latter method of examination is not desirable, external manipulation by palpation may be tried. While, in the examination per vaginam the woman may lie in the English and American obstetric position, upon her left side, or in the Continental upon her back, the latter posture is decidedly preferable for palpation. The lower extremities should of course be flexed, and all the preliminaries carried out as directed in a former chapter.

By pressure with the hands—gentle at first until the abdominal muscles become non-resistant—one may easily determine that the fœtus lies with its long axis parallel with that of the womb, and then by careful manipulation the hard spheroidal head may be felt at the superior strait of the pelvis, and the back of the child may be traced above it. The diagnosis then becomes narrowed down to whether the presentation be one of the face or vertex. By pressure with the fingers of one hand over the occipital aspect of the head, and with those of the other over the frontal region, and when the head has descended into the cavity of the pelvis, causing the points of the fingers to press correspondingly deep down in the pelvis, we may generally differentiate the vertex from the face.

The position of the head or vertex may also be made out by determining in what direction the dorsum of the child looks. If it points to the left of the mother and forwards, it is the left occipito-anterior; if to the left and backwards, it is the left occipito-posterior position; but if it looks to the right and anteriorly, it is the right occipito-anterior; if to the right and posteriorly, it is the right occipito-posterior position.

The back of the child can usually be distinguished from the front by its hardness and convexity. The anterior aspect being

softer, more irregular and concave, and has the flexed limbs resting upon it.

Auscultation.—If for any reason evidence is needed in addition to that afforded by the vaginal touch, or palpation, or both together, in order to diagnose the position we may auscultate the abdomen. The sound of the fœtal heart is heard below a horizontal line through the umbilicus in head presentation (Professor Depaul to the contrary). If the greatest intensity of the sound is heard below the umbilicus and to the left side of the abdomen, the child must be in either the first or fourth position of a vertex presentation. If, on the contrary, it is heard most distinctly below the umbilicus and on the right side of the maternal abdomen, the fœtus will be found in a second or third position of a vertex presentation. As the pulsation is transmitted best through the dorsal region of the child, if it is most distinct on the left and anteriorly, it is the first position; if to the left and posteriorly, the fourth position; if to the right and anteriorly, the second position; if to the right and posteriorly, in the third position.

We must be careful, however, not to confound a face with a vertex presentation, as the above rule in regard to the latter holds good also in respect to the former after the descent of the face into the cavity of the pelvis and rotation of the chin anteriorly has taken place, but until then the auscultatory signs of facial positions are different from those of the vertex, as may be seen by reference to Chapter XVIII. The reader must also consult the latter chapter for a differential diagnosis between vertex and other presentations.

Mechanism of Labor.—Although the mechanism of labor is one of the dryest and most difficult, yet it is one of the most important parts of the obstetric science. Without a knowledge of it the obstetrician is unqualified to render proper assistance to his patient, or to intelligently perform any obstetric operation.

The presentations and positions of the child as described by Baudelocque are so numerous that students, if required to study them at the present day, would be excusable in not making themselves masters of the subject, which has, however, been so simplified by the celebrated Naegelé and his successors that a little attention and industry will enable almost any one to understand it. I may here remark that the ancients believed that the head passed through the pelvis in the same manner as a semi-organized clot of

blood, or a mass of hardened fæces, without any of those mechanical changes known as flexion, rotation, extension, restitution, etc., that occur in the birth of a fully developed child through a normal pelvis. The first writer who differed from this doctrine was Sir Fielding Ould, who published a work in 1742, but he obtained only a glimpse of the truth, which was approached nearer and nearer until Saxtorph, of Copenhagen, and Solayres de Renhac, of Montpellier, in 1771, without any previous knowledge of each other's opinions, published two essays, which agreed that in natural labor the long diameter of the child's head entered the pelvis parallel to one of its oblique diameters, and that in a very large proportion of labors the long diameter of the child's head occupied the right oblique diameter of the pelvis, or that running between the right sacro-iliac synchondrosis and the left foramen ovale.

Through Baudelocque's great influence this opinion was gradually adopted by the profession; but there were many erroneous ideas mingled with it that were finally pruned off by the great Naegelê, of Heidelberg, who also made many additions of his own; and, as before stated, simplified the whole subject. His essay was first published in 1818. Although his pamphlet was insignificant in size and appearance, it was destined to exercise a greater influence on the science of obstetrics than any work of equal dimensions ever published.

As the head presents in 95 per centum of all labors, and as a study of its mechanism in parturition will render that of all other presentations easy to be comprehended, I shall enter into its description first, and treat of the mechanism of the face, breech, etc., subsequently.

Presentation and Position.—In studying the mechanism of labor it is especially important to have a clear idea of the meaning of the words presentation and position, and the distinction between them. Unfortunately the former word has two significations, one being a general one, while the other is more limited in its meaning. By presentation in its broader sense we mean that portion of the fœtus found at the superior strait at the time of labor, as the head, breech, shoulder, etc., while in the more restricted meaning, presentation, as used by American and British obstetricians, signifies not a large part or polar extremity of the child, as the head, etc., but the actual point on its surface which

presents, as the vertex for instance in cranial presentations. Prof. Hodge, in defining the word presentation in this more restricted sense, says it is "that portion of the fœtal ellipse which is recognized toward the centre of the canal of the pelvis and vagina." Dr. Tyler Smith defines it as "that portion of the fœtal head felt most prominently within the circle of the os uteri, the vagina, and the ostium vagina, in the successive stages of labor." But presentation, whether used in its broader or limited sense, must not be confounded with the word position, which signifies the particular situation of the presenting part to different points of the superior strait, or the relation which its diameters bear to those of the upper strait; or, in other words, the relation which the extreme points of the longitudinal diameter of the presentation bears to the extreme points of the oblique diameter of the brim of the pelvis. For example, if on passing our finger into the os uteri it impinges against the cranium, we say it is a head presentation in the broader meaning of this word. If the particular point of the head that is most prominent or dependent is the vertex, we may say, in the restricted definition of the word, that it is a vertex presentation. If the os uteri be sufficiently dilated for us to determine that the occipital end of the long diameter of the cranium points to the left ilio-pectineal eminence or foramen ovale of the left side of the pelvis, we know that the child's head is in the left occipito-anterior position.

As there is scarcely a single point on the surface of the body of the child that may not, under particular circumstances, be felt most prominently in the circle of the os uteri, it is obvious that presentations may be multiplied to an unlimited extent; and so may positions, as the long diameter of the fœtal head or of any other presenting part may, under certain circumstances, lie at the brim in the transverse, oblique, or any intermediate pelvic diameter, except the antero-posterior, where there is no room for a full sized, well-proportioned head. But a fœtal cranium of a relatively small size to the maternal pelvis, or the head of a premature child, may find sufficient space for its long diameter in the conjugate or antero-posterior of the pelvis. Hence some authors make an occipito-pubic and an occipito-sacral position.

When parturition has fairly commenced, however, certain parts of the child, one in each labor, of course, do really present to the exclusion of almost all others. And so in regard to positions.

Although a certain presentation, the head for instance, may lie at the brim in any position previous to parturition, yet when labor has fairly begun the head will almost invariably be found entering the normal pelvis in one of its oblique diameters. Hence, practically, there need be described only four positions, two for each oblique diameter. These, in a head presentation, are:

THE FIRST, OR LEFT OCCIPITO-ANTERIOR POSITION, in which the long or occipito-frontal diameter of the head corresponds to the right oblique diameter of the pelvis, the occiput points towards the left ilio-pectineal eminence, foramen ovale, or acetabulum, and the forehead to the right sacro-iliac synchondrosis.

THE SECOND, OR RIGHT OCCIPITO-ANTERIOR POSITION, in which the long diameter of the head corresponds to the left oblique diameter of the pelvis, the occiput points towards the right ilio-pectineal eminence, foramen ovale, or acetabulum, and the forehead to the left sacro iliac synchondrosis.

THE THIRD, OR RIGHT OCCIPITO-POSTERIOR POSITION, in which the long diameter of the head corresponds to the right oblique diameter of the pelvis; the occiput points to the right sacro-iliac synchondrosis, and the forehead towards the left ilio-pectineal eminence, foramen ovale, or acetabulum.

FOURTH, OR LEFT OCCIPITO-POSTERIOR POSITION, in which the long diameter of the head corresponds to the left oblique diameter of the pelvis, the occiput points to the left sacro-iliac synchondrosis, and the forehead towards the right ilio-pectineal eminence, foramen ovale, or acetabulum. Four other positions are sometimes described by authors, depending upon whether the fœtal head lies in the antero-posterior diameter of the brim, with its occiput to pubis or sacrum, or whether it lies in the transverse diameter of the brim, with its occiput to the left or right side. As these positions are so exceedingly rare, they are generally omitted by modern English authors, especially Churchill, Meadows, Leishman, and Playfair.

OBLIQUE DIAMETERS.—There are two oblique diameters,—the right and left. What Hodge and a few others term the left oblique diameter, Leishman, Playfair, and most British authors call the right. I shall follow the latter custom, and denominate that the right, which starts from the right sacro-iliac synchondrosis, and the other the left, which begins at the left sacro-iliac joint.

VERTEX.—As there is some confusion in the meaning of the

term vertex as used by different authors, it may be well for me to state that by it I mean the "crown" of the head, or that part of the superior and posterior part of the head described as follows by Professor Hodge: "If the leg of a compass be fixed at the apex of the triangle of the posterior fontanelle, and a radius be taken extending from this point to the great occipital protuberance, a circle may be described which will include the superior portion of the occipital, and the posterior angles of the parietal bones, and will cross the middle of the biparietal suture. The space thus included is the proper vertex."

Relative Frequency of the Cranial Positions.—All authorities concur in stating that the first position is greatly the most frequent, Naegelé believing its percentage to be seventy, Simpson and Barry 76.45, and Swayne 86.36.

Nearly all authors agree that the third position is the next most frequent. Naegelé putting it down at 29 per centum. This, when added to 70 for the first position, would make 99 per centum for the lying of the head in the right oblique diameter. Many modern obstetricians believe that the frequency of the third position is much overrated, and that the second, which Naegelé considered only a transitional stage of the third, is much more common than this celebrated Professor believed; Murphy asserting it to be equally as frequent as the third. But the opinion of the latter author is perhaps as extreme in one direction as that of Naegelé in the other. The percentage of the fourth position varies from .03 to 4.42—the first being the opinion of Naegelé, and the second of Murphy.

Right Oblique Diameter.—But why should the long diameter of the fœtal head correspond so frequently with the right oblique diameter of the pelvis? There are various answers to this question, but the most reasonable is that of Simpson, who states that the head lies most frequently in the right oblique diameter, because the left oblique is more or less shortened by the presence of the rectum, which is so often distended by fecal matter.

First Position.—When the head, in the first position, begins to pass through the superior strait, its occipito-frontal diameter lies in the right oblique diameter of the pelvis; the occiput points towards the left ilio-pectineal eminence, foramen ovale, or acetabulum, and the forehead to the right sacro-iliac synchondrosis (Figs. 66 and 67). The child's back is turned towards the left side of

the abdomen of the mother. Its left shoulder points somewhat to her left side, and the right to her right. In a vaginal exami

FIG. 66

Attitude of Child in First Position (after Hodge).

nation, the finger will usually impinge, if the os is sufficiently dilated, upon the right parietal bone, somewhere between its protuberance and its posterior superior angle.

FIG. 67.

First Position.

Although this point is the one most easily reached, as a rule by the finger, the vertex is really the most dependent portion o

the head, and is the real presenting part, in the limited sense of the word presentation, as previously given.

Running obliquely across the pelvis is the sagittal suture, which, if traced upwards and towards the left of the pelvis, the woman being in the dorsal obstetric position, will lead to the posterior fontanelle. It is, however, not always easy to reach the latter unless the cervix is considerably dilated. This fontanelle may easily be recognized by its triangular shape, and by the lambdoidal sutures diverging from it.

If we could trace the sagittal suture sufficiently downwards and to the right side of the pelvis, we would feel the large anterior fontanelle; but that, at this early stage of labor, is beyond our reach.

As already stated, the head at the very commencement of labor usually lies within the pelvic brim. This rule is more general with primiparæ than with multiparæ, because, in the latter, the relaxation of the parietes of the abdomen lets the uterus have a greater anterior inclination, and the head of the fœtus rests rather on the edge of the brim than in it. Yet, even in pluriparæ, when the head is not in the brim, it enters very soon after the beginning of labor, and generally passes through it sooner than in primiparæ.

Obliquity of Head to Plane.—Professor Naegelé and most subsequent writers describe the head in the first position as entering the pelvis obliquely to the plane of the brim, that is, with its right parietal bone much lower than the left. This opinion is being gradually abandoned by the profession, in favor of the one admitting the parallelism of the biparietal plane and that of the brim.

Mechanical Movements.—Under the head of Labor and its Phenomena, a description was given of the three stages of labor. Unfortunately, it is the habit of some authors to apply the same term, stages of labor, to the different movements of the fœtus in its course through the pelvis during labor, thus creating some confusion. A few writers make as many as six, while others make four or five of these stages. As the latter term is already applied to the three great stages of labor, I shall use the term mechanical movements in describing the progress of the child through the pelvis. These are:

The movement of flexion.
The movement of descent and levelling.
The movement of rotation.
The second movement of descent, extension, and expulsion.
The external movements of restitution and rotation.

While obstetricians find it convenient to divide the mechanism of labor into movements or stages, in order to facilitate description, it must be borne in mind that these movements are not always distinct, and do not always succeed each other in the order assigned them, but that they sometimes run insensibly into one another, and two or more of them may occur at the same time.

Flexion.—At the end of gestation the head of the child is in a state of demi-flexion. The effect of the first pains is to increase the flexion more firmly upon the sternum, so as to cause the occiput to descend lower than the front part of the head, and the posterior fontanelle will be brought nearer the centre of the pelvis, while the anterior fontanelle will be slightly elevated, thus substituting the occipito-bregmatic for the occipito-frontal diameter at the brim of the pelvis.

These movements, therefore, by causing a diameter at least half an inch shorter than the long diameter, to be brought into relation to the oblique of the superior strait, render the descent of the head more certain, easy, and rapid. The flexion is most complete where the pelvis is small in proportion to the fœtal head, and the pains the strongest. This movement, according to Solayrès and most authors, may be accounted for by the expulsive force being communicated to the head through the vertebral column, which, being articulated nearer the occiput than the forehead, must, where the resistance is equal, push the former down faster than the latter. Playfair thinks that this is the true explanation after the membranes have been ruptured, but not previous to that event, as the ovum, prior to the rupture, is practically a bag of water, which is equally compressed at all points. He states that under "such circumstances, the flexion is probably effected in the following way: The head being articulated nearer the occiput than the forehead, and being equally pressed upon from below by the resisting structures, the pressure is more effectual on the forehead; consequently, that is forced forwards, and the occiput descends."

But whether the expulsive force pushes the short arm of the

lever down, by being applied near to it, or the resisting force, the long arm up, the result is practically the same,—a flexion of the head on the trunk, and a consequent lessening of the long diameter of the fœtal head.

Movement of Descent and Levelling.—The fœtal head now moves directly downwards and backwards in the axis of the superior strait, until it comes near the perineum or floor of the pelvis. At first its movement is slow, but so soon as the os uteri becomes fully dilated, it is decidedly more rapid. When the forehead reaches a point opposite the second bone of the sacrum, and the occiput that nearly opposite the inferior part of the foramen ovale, a levelling movement takes place, by the anterior fontanelle descending more on a level with the posterior, and the chin becoming less firmly flexed on the sternum. This levelling process is due to the fact that the occiput, being in advance, meets with greater resistance than the forehead, and is retarded, while the former is left more force to descend, until it likewise approaches the floor of the pelvis, and encounters like resistance.

Movement of Rotation.—The head having descended to the floor of the pelvis, with the occiput lying just above the left ischial spine, and being thus between two forces, one of propulsion by the labor-pains above, and one of resistance from the left ischial spine and the perineal structures from below, is forced as a necessary resultant to rotate anteriorly along the smooth bevelled surface of the ascending ramus of the left ischium, while the projection of the spine of the right ischium prevents a forward movement of the forehead, which glides backwards into the hollow of the sacrum, thus changing the occipito-frontal diameter of the head from the oblique diameter of the cavity of the pelvis to the antero-posterior diameter of the inferior strait, as is shown in Fig. 68.

Second Movement of Descent, with Extension and Expulsion.—The movement of rotation having left the head with its long diameter corresponding to the antero-posterior diameter of the outlet of the pelvis, or a diameter between it and the oblique, the head continues to be pressed downwards until its occiput passes between the rami of the pubes and is expelled. As the occiput is gradually being forced down and forwards beneath the symphysis pubis the chin leaves the sternum, producing a movement of extension, which, however, does not become very marked until the occiput emerges beneath the pelvic arch, and the nape of the neck

is allowed to rest for a time against the latter, when the expulsive force, no longer affecting the occiput, is brought to bear more fully upon the anterior portion of the fœtal head, causing the chin to recede more rapidly from the sternum.

The face in the meantime sweeps over the lower portion of the sacrum, pushing back the coccyx from half an inch to an inch, and

FIG. 68.

gradually extending the perineum, and is finally extruded. At the very moment that the face is born, the head, the back of which was turned up in front of the mons veneris, falls back over the perineum. These various degrees of extension of the head are well represented in Fig. 69.

The perineum is always rendered very thin by the expansion, which is sometimes so great just prior to the expulsion that the head seems to be outside of the pelvis, and yet embraced by the perineum. The anus, under these circumstances, is occasionally drawn very widely open.

The expulsion of the head from the pelvis (Fig. 70) is the resultant of two forces, the expelling force of the uterus and its accessories, acting downwards and backwards, and of the resistance of the posterior walls of the pelvis, especially the perineum, acting

almost directly forwards. In other words the head is forced to describe a diagonal of these two forces, and pass downwards and forwards in the axis of the pelvic outlet.

FIG. 69.

The head is seen in various degrees of extension, the nape of the neck resting first behind, and then under, the symphysis pubis. (From Cazeaux.)

MOVEMENT OF RESTITUTION.—Since the publication of the theory of M. Gerdy, denying that true restitution ever takes place, there has been much difference of opinion upon the subject. But the truth appears to be that, although this is not so common as supposed before M. Gerdy's publication, it does, nevertheless, sometimes

FIG. 70.

First Position: Head Delivered (after Hodge).

occur. The movement must not be confounded with external rotation, to be alluded to presently. It is a turning of the occiput towards the left groin (not directly to the thigh as in external rotation) of the mother immediately on the expulsion of the head. It is owing to an untwisting of the neck. In the few cases of its occurrence the shoulders do not change from an oblique to a trans-

verse position when the conjugate diameter of the head rotates in the cavity of the pelvis from the oblique to the antero-posterior diameter, and consequently there is a certain degree of torsion of the neck. Upon the birth of the head the occiput turns sufficiently towards the left groin to relieve the torsion, and thus restores the head to its former relations with the trunk. It is thus that true restitution is produced.

Movement of External Rotation.—This is a turning of the antero-posterior diameter of the head, shortly after expulsion, to a transverse position to the pelvis, with its occiput (in the first position) looking towards the left, and its forehead to the right thigh of the mother (Fig. 71). It is a secondary movement to restitution

Fig. 71.

External Rotation of Head in First Position (after Hodge).

when the latter takes place, but otherwise a primary one. It is not a mere restoration of the head to its natural relation to the trunk, as in restitution, but is caused by the shoulders being expelled in the conjugate diameter of the inferior strait; that is, with the right shoulder under the symphysis pubis, and the left over the perineum. Of course this description answers only for the first position. In the second position when restitution occurs the occiput looks towards the right groin, and when external rotation takes place it is turned to the right thigh.

By means of either restitution or external rotation, or both, we may confirm or correct our diagnosis of position in any given case. It is well, however, to bear in mind that there are exceptions to the general rule just mentioned in regard to restitution and rota-

tion; for examples occasionally arise, where, after delivery in the first position, the occiput turns toward the right groin or thigh, and cases in the second position where it rotates to the left groin or thigh.

From the foregoing remarks it will be seen that external rotation is not an independent movement, as supposed by Baudelocque, but is produced by the rotation of the shoulders. It is proper to state, before closing this part of the subject, that in the first position when the head is expelled, the right shoulder reaches the symphysis

FIG. 72.

pubis by rotating along the right anterior inclined pelvic plane, while the left shoulder rotates backward upon the left posterior plane.

The shoulders are usually expelled by the first good pain which follows the birth of the head, the left shoulder commonly making its exit first, followed immediately afterwards by the right, although they may both be expelled simultaneously, or the anterior one first. The birth of the body of the child occurs immediately after that of the shoulders, and generally by the same pain. The various mechanical movements of the fœtus during labor in the first position of the fœtal head are admirably depicted in the above diagram from Schulze's plates (Fig. 72).

Mechanism of Labor in the Second, or Right Occipito-anterior Position.—In the second cranial position the head lies in the left oblique diameter of the pelvic brim, the occiput looks towards the right ilio-pectineal eminence, foramen ovale, or acetabulum, and the forehead towards the left sacro-iliac synchondrosis (Fig. 73). The most depending part of the head is the posterior-superior portion of the left parietal bone. As labor progresses it is this part that first distends the labia, and upon which the caput succedaneum forms.

The sagittal suture will be found running across the pelvis in the left oblique diameter. The mechanism of delivery in the second is precisely the same as in the first position, except that the move-

Fig. 73.

Second Position.

ments of internal and external rotation and restitution are in opposite directions to those of the first position. For example, in the latter position the occiput in the cavity of the pelvis rotates from left to right, and externally from right to left; whereas in the second position the occiput in the cavity rotates from right to left, and after expulsion from left to right. The same comparison holds good in regard to the rotation of the forehead and shoulders. So that we may describe the mechanism of the second position in the same language as that of the first, by substituting the word left for right wherever used.

Mechanism of Labor in the Third, or Right Occipito-posterior Position.—In this position (Fig. 74) the long or occipito-anterior diameter of the head lies in the right oblique diameter of the pelvis, the same as in the first position, but with its poles reversed.

That is, its occipital pole, instead of pointing to the left iliopectineal eminence or foramen ovale, as in the first position, now looks towards the right sacro-iliac synchondrosis. The anterior and posterior fontanelles will occupy in this position the reverse order that they did in the first position, the latter being backwards and the former forwards; but the sagittal suture will still be in the right oblique diameter, with reversed ends, however.

FIG. 74.

Third Position.

Upon a vaginal examination the finger will first impinge upon the left parietal bone at its protuberance or anterior thereto. The occiput in most cases of labor in this position rotates forward along the right side of the pelvis until it lies in, or nearly in, the antero-posterior diameter of the outlet, and makes its exit beneath the pubic arch, the forehead gliding over the perineum. The occiput in thus rotating anteriorly must in a part of its course occupy the second position. The mechanism of labor from that stage onward is the same as though the head occupied the latter position primarily. The anterior rotation of the occiput in the third position, though at one time considered abnormal, is at present looked upon as the normal mechanism, while its rotation backward into the hollow of the sacrum, which occasionally occurs, is considered abnormal and very rare. When this posterior rotation of the occiput does take place, labor is rendered much more tedious, difficult, and dangerous. It seems to depend upon various circumstances, but chiefly upon the fact that the forehead is allowed to descend too fast in comparison to the de-

scent of the occiput. In other words, it is believed that if the chin is firmly flexed upon the sternum, and the occiput permitted, or forced to descend far in advance of the forehead, so that the latter will be above the left ischial spine, while the former will be below the right ischial spine, there will be less difficulty in the forehead passing backward in the hollow of the sacrum and of the occiput rotating forwards under the arch of the pubis.

If in the third position, when the head has descended considerably, an examination reveals the fact that the forehead is almost or quite as low in the pelvis as the occiput, a posterior rotation

FIG. 75.

Fronto-anterior Termination of the Third Position (after Leishman).

may be predicted, though occasionally, even when a case seems to be irrevocably fixed into a difficult occipito-posterior position, rotation of the occiput forwards takes place.

When the occiput does pass backwards into the hollow of the sacrum the soft parts become enormously distended before labor can be completed. The occiput in such a case usually glides out over the fourchette, turns backwards in strong extension, and allows the nape of the neck to rest against the perineum, when the forehead, nose, and chin sweep in succession from under the

pubic arch and the head is delivered. The various stages of an occipito-posterior termination of the third position are shown in Fig. 75. After the birth of the head the first pain, if very strong, usually expels the body.

MECHANISM OF LABOR IN THE FOURTH OR LEFT OCCIPITO-POSTERIOR POSITION.—This is universally acknowledged to be by far the least frequent of the four cranial positions, occurring, according to Madame Boivin, in the ratio of .05 per cent., and according to M. Naegelé in only .03 per cent. of head presentations, although Murphy gives the percentage at 4.42. The occipito-frontal diameter of the head corresponds to the left oblique diameter of the pelvis, the occiput looks towards the left sacro-iliac synchondrosis,

FIG. 76.

the forehead to the right ilio-pectineal eminence, foramen ovale, or acetabulum, the long diameter of the head thus occupying the same oblique diameter as in the second position, but the head being reversed, or having its forehead where the occiput is in the second position, and its occiput where its forehead should be. (See Fig. 76.)

The examining finger will touch the right parietal bone, but more anteriorly than in the first position. The mechanism is the same as in the third position, only that the rotation of the occiput is from left to right instead of from right to left, when the usual and normal anterior movement of the occiput occurs. So also when the occiput rotates into the hollow of the sacrum, it does so as in the third position, only rotating from left to right instead of the reverse. When rotation has taken place, either anteriorly, or posteriorly, the child is delivered as in corresponding stages of

the third position. Usually, however, in the latter, the occiput after extrusion of the head, turns to the right, while in the fourth position it looks to the left thigh of the mother. In the course of the anterior rotation of the occiput in the fourth position it is converted into the first position, just as the third is changed into the second position.

CAPUT SUCCEDANEUM.—This is the name of the swelling that occurs on the child's head during labor, and is the result of effusion of serum or blood, or both, beneath the scalp.

Contrary to the statements usually made by obstetric authors it is not formed on the part of the head where the pressure is the greatest, but where it is the least. In the early part of parturition it forms on that portion of the head within the circle of the os uteri, but may as labor advances form on other parts if they come within the axis of the vaginal canal. In the first and fourth positions it forms on the right, in the second and third on the left parietal bone. In the two occipito-anterior positions it forms at or near the posterior superior part of the presenting parietal bone; while in the two occipito-posterior positions it takes place more anteriorly, generally at or a little in front of the protuberance of the respective parietal bone.

CHAPTER XX.

FACE PRESENTATIONS.

PRESENTATIONS of the face are often classed by authors under the head of unnatural labor. It is not surprising that the older writers should have done so, as they erroneously believed that delivery in this presentation was impossible by the natural efforts, and that turning was necessary in all cases. But why such later authors as Churchill and Meadows should adhere to this classification is not so plain, especially the latter, as he approvingly makes the following quotation from Dr. W. Hunter's MS. lectures: "In this case I do not turn the head round in order to deliver, but nineteen times in twenty leave it to itself to come as it will," and adds that the same opinion is expressed and the same practice adopted by most English authorities.

Smellie was among the first to recognize the fact that spontaneous delivery is possible, but it was many years subsequent to the announcement of his opinion that obstetricians were generally willing to acknowledge that in the majority of face presentations the child could be delivered without assistance. But while this is so it must be admitted that labor in these cases is generally more tedious and difficult than in vertex presentations, and every now and then presents obstetric complications of the most formidable character. This is especially so in those unfortunate cases where the chin, instead of rotating forwards under the pubic arch as it naturally ought to do in all positions of face presentations, rotates back into the hollow of the sacrum, and the chest becomes wedged in the pelvis with the head, so as to produce a complication like the one so graphically illustrated by Professor Hodge in Fig. 77.

FREQUENCY.—According to Churchill's statistics of French, German, and British practice, there were 1167 face presentations in 260,817 cases, or about 1 in 223½ cases.

CAUSE.—There is but little doubt that many, if not most, cases of face presentations are transformations of presentations of the vertex. All that is necessary for this change is the hooking of the occiput on the brim of the pelvis during the descent of the

head, thereby producing a bending back or extension of the latter on to the nape of the neck, and a consequent descent of the face. This change may be favored, as Hecker supposes, by a dolichocephalous form of the cranium—that is, a head elongated at its

FIG. 77.

Chest Engaged with Head (after Hodge).

occipital end, especially at the occipital protuberance. Yet it is highly probable that there are many cases of face presentations from the beginning of labor.

DIAGNOSIS.—For the diagnosis of face presentations I must refer the reader to the chapter upon the Diagnosis of Presentations and Positions of the Fœtus. It is important to bear in mind that the obstetric meaning of the word face is more extended than the anatomical, as it includes the forehead. The long diameter of the face extends from the centre of the forehead between the frontal protuberances to the point of the chin. This diameter in the four positions of the face that we shall describe will correspond at the upper strait after labor has fairly begun, if not before, to one or the other oblique diameters of the pelvis, and after rotation has occurred to the antero-posterior diameter of the outlet. Although for the sake of brevity I shall hereafter allude only to the foramen ovale as the anterior point on each side of the pelvis to which

certain parts of the child point in the different presentations and positions, I desire it to be understood that the other points mentioned in vertex presentation—"ilio-pectineal eminence," or "acetabulum"—would be equally applicable.

For all practical purposes it is only necessary to divide the presentations of the face into four positions, as follows:

First, or Left Fronto-anterior Position.—The forehead points to the left foramen ovale, and the chin to the right sacro-iliac synchondrosis,—the long diameter of the face corresponding to the right oblique diameter of the pelvis. This is a transposition of the first position of the vertex, and the back of the fœtus lies to the mother's left side, the same as in the vertex position. It is probably the most frequent face position, although Leishman and others assert that the fourth position is the most common.

Naegelé considers the first as the most frequent position, bearing the proportion to the second as twenty-two to seventeen. Tyler Smith says that the "third and fourth facial positions are so extremely rare as hardly to be worth enumerating." The part lowest in the pelvis in the first facial position is the right malar bone, upon which the caput succedaneum forms.

Second, or Right Fronto-anterior Position.—The forehead points to the right foramen ovale, and the chin to the left sacro-iliac synchondrosis. The long diameter of the face corresponds to the left oblique diameter of the pelvis. This position of the face is a change from the second position of the vertex. The part lowest in the pelvis is the left malar bone upon which the caput succedaneum forms, if at all.

Third, or Right Fronto-posterior Position.—The forehead in this position looks towards the right sacro-iliac synchondrosis, and the chin to the left foramen ovale,—the long diameter of the face occupying the right oblique diameter of the pelvis as in the first position, but with its poles reversed. This is a transposition from the third vertex position. The caput succedaneum forms on the left side of the face, which is lowest in the pelvis.

Fourth, or Left Fronto-posterior Position.—In this position the forehead looks towards the left sacro-iliac synchondrosis and the chin to the right foramen ovale, and the long diameter of the face occupies the left oblique diameter of the pelvis. This is a conversion of the fourth position of the vertex, and is the opposite of the second position of the face. The caput succedaneum

will be found on the right malar bone, which is the part deepest in the pelvis.

Mechanism of Delivery in the First Position of the Face.—In a presentation of the face, the forehead, so far as the name of the position is concerned, represents the occiput in a presentation of the vertex, but in its mechanism it is better to consider the chin as representing the vertex, because we can then the better remember that the proper rotation of the chin, as of the vertex, for the most favorable birth, is forwards under the arch of the symphysis pubis. In this connection it is well to bear in mind that the mento-anterior (or fronto-posterior) positions of the face, like the occipito-anterior of the vertex, are the most natural for quick, easy, and safe delivery; yet while the terms first and second are applied to the occipito-anterior positions of the vertex, those of the third and fourth are given to the mento-anterior positions of the face.

Probably the chief reasons for calling the mento-posterior positions of the face the first and second positions are, that they are generally transformations of the first and second positions of vertex presentations, and are far more frequent than the mento-anterior positions of the face, which are extremely rare. It is well to bear in mind, however, that the first position of the face, although probably the most frequent of facial positions, is not proportionately as frequent as the first of the vertex. For the sake of convenience the mechanism of face cases may be divided into the following movements:

First movement, or forced extension;

Second movement, or descent;

Third movement, or rotation;

Fourth movement, or flexion;

Fifth movement or external rotation, or restitution.

We shall consider these movements in their regular order in the *first position*, or *left fronto-anterior of the face*, and shall point out the slight modifications required in the other three positions.

First Movement, or Forced Extension.—Although the mechanism of the face is closely analogous to that of the vertex, especially in descent, rotation, and restitution, yet the first movement in face cases, instead of being forced flexion as in vertex presentation, is forced extension; that is, the chin is separated as

far as possible from the sternum, and the occiput is pressed firmly back against the nape of the neck. This rarely occurs to its full extent until the membranes have been broken. Previous to that time the mento-bregmatic diameter may correspond to the pelvic brim; but when forced extension has taken place, and the face has fairly commenced to descend into the pelvic cavity, the fronto-mental diameter will be found lying in the right oblique diameter of the superior strait.

Second Movement, or Descent.—The chin descends in advance of the forehead, because in forced extension of the head the expelling force is brought to bear through the vertebral column nearer the chin than the forehead, so that if we consider the fronto-mental diameter as a lever, and allow that the resistance is equal along its whole length, the part nearest to that to which the force is applied—the chin—must necessarily, until the conditions are changed, descend faster than the long arm of the lever, or that represented by the forehead.

The mechanism in this respect is similar to what occurs in the descent of the occiput in vertex presentations, except that the force in that case being applied to the head through the vertebral column, nearer the occiput than the forehead, causes the former to descend faster than the latter until it reaches the perineum, when the conditions are modified.

It is asserted by many accoucheurs that the shortness of the neck prevents a descent of the face so low as the perineum; but this is probably an erroneous view of the subject, as the neck from the sternum to the chin during forcible extension of the head is from three and a half to four inches in length, which is amply sufficient for a descent of the face to the floor of the pelvis. Aside from mere theory it is a fact often noticed that the chin in mento-posterior positions does really descend so as to press upon and partly distend the perineum before rotation takes place.

Third Movement, or Rotation.—In all the positions of the face the natural and almost universal rotation of the chin is forwards and under the symphysis pubis, though there are examples of rotation backwards into the hollow of the sacrum, thus constituting one of the most formidable difficulties in obstetrics, as will be seen further on.

The chin has a much greater space to rotate over in the first and second than in the two fronto-posterior or mento-anterior

positions. Of course, as it rotates forwards on the right side of the pelvis in the first and fourth positions, the forehead must rotate posteriorly on the left side of the pelvis, and as the chin rotates anteriorly on the left side of the pelvis in the second and third positions the forehead must take the reverse movement on the right side. The greater length and peculiar formation of the anterior inclined planes are ascribed by Hodge and other authors as the reason why the chin in fronto-anterior, or mento-posterior positions of the face generally rotates under the arch of the pubis rather than backwards into the hollow of the sacrum. The latter movement occurs whenever the chin strikes one of the posterior inclined planes; but this occurrence is exceedingly rare, as the spinous process of the ischium of the respective side almost invariably directs the chin on to one of the anterior planes.

The reader will find, on reference to another chapter, that anterior and posterior inclined planes of the pelvis, mean something more than the anterior and posterior inclined planes of the ischium of each side of the pelvis.

Fourth Movement, or Flexion.—In a vertex presentation, after rotation of the occiput beneath the pubic arch, extension takes place. In a face case, the opposite movement of flexion occurs when the chin has rotated beneath the arch. After the chin has passed out so far as possible beneath the pubic arch, it remains with its under surface resting against the latter; when flexion is accomplished by the forehead, bregma, vertex, and occiput, sweeping downwards and forwards over the lower part of the sacrum, coccyx, and distended perineum, and appearing in the order named, at the posterior commissure of the vulva, over which the occiput glides, and the birth of the head is completed. In this movement these parts describe an arc of a circle around the chin as a centre.

Fifth Movement, or External Rotation.—When the head is born, the face, in a first position, turns to the right side of the pelvis. In other words, external rotation takes place in a precisely similar manner to the same movement in vertex presentations, and is the consequence of the internal rotation of the shoulders into the antero-posterior diameter of the inferior strait.

Fig. 78 shows the various mechanical movements of labor in a first position of the face. The foregoing description of the mechanism of labor, in the first facial position, will apply, with

slight modifications, the most of which have been mentioned, to the other three positions, and, therefore, it is unnecessary to describe the mechanism of the latter. It is, however, proper to state that, although the mechanism of labor in face presentations, in the great majority of cases, is as just described, with the chin being born anteriorly and the occiput posteriorly; yet there are

FIG. 78.

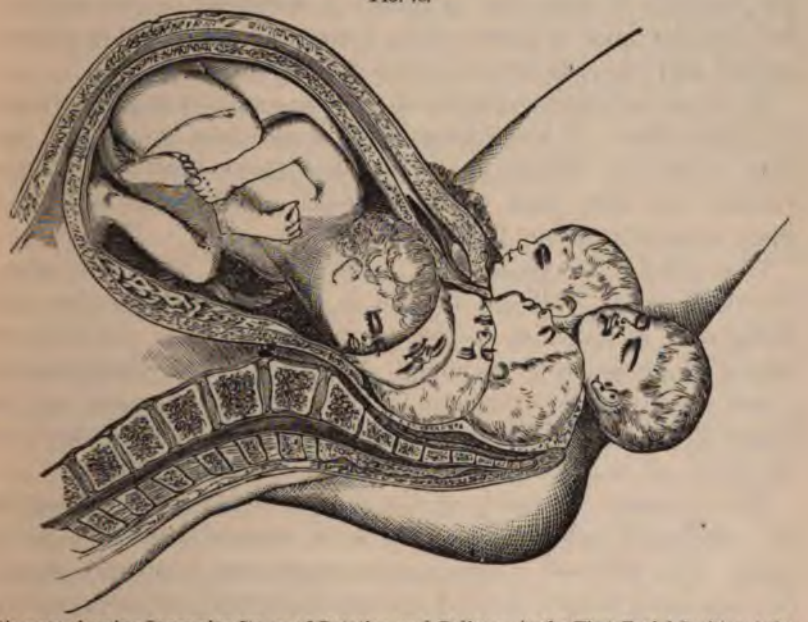


Diagram showing Successive Stages of Rotation and Delivery, in the First Facial Position (after Leishman).

a few examples of fronto-anterior, or mento-posterior, where the chin rotates backwards into the hollow of the sacrum, instead of forwards, beneath the symphysis pubis, giving rise to one of the most serious of the complications of obstetrics (Fig. 77, p. 314). It is even doubtful whether a child in such a case, can be naturally born unless its head is unusually small, or the pelvis very large. When, under such conditions, birth does occur, the head descends until the forehead becomes fixed against the posterior part of the symphysis pubis, when the chin continues to be forcibly pressed down, until it glides over the posterior commissure of the vulva, when flexion occurs, and the occiput is expelled beneath the symphysis pubis. These cases of non-rotation of the chin forwards,

correspond to the occipito-posterior positions, in which the face is born looking anteriorly, but they are much less tractable, either to the efforts of nature or of art.

Prognosis.—Before the labors of Boër, of Chevreul, and Madame Lachapelle proved the contrary, it was generally believed that natural delivery in face presentations is impossible. We now know that spontaneous delivery is the general rule, and that, in the majority of cases, the prognosis is favorable to the mother, but that the labor is more tedious than in vertex or pelvic presentations, and the risk to the mother slightly greater.

So far as the child is concerned, the risks are much greater than in vertex cases. It is estimated that even where rotation of the chin under the symphysis pubis takes place, one-tenth of the children are born dead, while the death of the fœtus is certain when anterior rotation does not occur.

It is well for the accoucheur to bear in mind that, even when the child is not stillborn, its face is always greatly swollen and disfigured; so much so, indeed, in some cases, that the features cannot be recognized. Although this disfiguration disappears in a few days, it is very alarming to the parents, who are apt to blame the physician, unless he forewarns them before the birth of the child, of its probable occurrence and short duration.

The increased mortality of the child is owing to the repeated and prolonged compression of its neck, especially of the jugular veins, while the neck is clearing the cervix-uteri or superior strait, but especially when it is fixed against the symphysis pubis during the time the occiput is sweeping over the sacrum, coccyx, and distended perineum.

The first and second, or fronto-anterior positions of the face, are far more unfavorable, both to the mother and the child, than the third and fourth, or fronto-posterior positions; because, in fronto-anterior positions a much greater rotation occurs than in fronto-posterior, unless the chin rotates into the hollow of the sacrum, when the danger, for other reasons, is still greater. In the great majority of these cases the chin, in its descent, strikes against one of the anterior inclined planes, and rotates forwards under, or towards the pubis. In the first and second positions, even when the chin does rotate anteriorly, much delay and difficulty sometimes occur, but, of course, never to that extent experienced in the posterior rotations of the chin.

TREATMENT.—As already stated, the older accoucheurs, or those of the last century, deemed artificial assistance necessary in all cases of face presentations, and recommended version by the feet or head, where the presenting part was still at the brim, or had not descended too low in the pelvis for turning to be effectual, and advised instrumental delivery in all other cases.

The advice of later authors is to avoid interference so far as possible, and, as a general rule, to trust to the efforts of nature, as she is generally equal to the emergency. It is true that labor in face presentations is more protracted and painful, and attended with more risks to the child than in vertex cases, chiefly because the bones of the face, unlike those of the cranium, will not mould themselves to the form of the pelvis; still the result is usually favorable.

Assistance may be useful, or necessary, where the *face cannot descend into the cavity of the pelvis, but remains above the brim;* or, having passed into the latter, is delayed by *uterine inertia*, or *non-rotation forwards of the chin.*. When the face remains above the brim it is proper to turn, either by introducing the hand into the uterus and bringing down the occiput, so as to convert a face into a vertex presentation; or, what is, perhaps, better, by seizing the feet and bringing them down. Some cases could be better managed by external and internal, or combined manipulation. The forceps cannot be used to much advantage in so high a position of the face. Professor Hodge, of Philadelphia, advised turning by the head in all cases where face presentations are detected at the brim, and have not passed the cervix uteri, provided the latter is dilated. That is, in all cases of face presentation, whether there be difficulty or not in descent of the presenting part. But his advice is not followed by many accoucheurs of the present day. If the head is delayed after descent into the cavity of the pelvis from *uterine inertia*, the usual means for this condition in vertex cases may be brought into use, such as manual pressure of the uterus through the abdomen during a pain, the removal of any ascertainable cause, and lastly, a resort to the forceps.

In the *fronto-anterior*, or *mento-posterior positions* of the face, after descent into the pelvic cavity, if the chin does not readily rotate forwards under the arch of the pubis, various means may be used in facilitation. A plan not mentioned in the books, that I think might succeed, is to press the finger against one side or the other

of the head, depending upon the position, just behind the frontal eminence or protuberance, in such a manner as to assist forward rotation of the chin. In the first position, for example, the pressure should be made against the right side of the head, in a gradual manner, only during pains, so as to push the os frontis from opposite the left foramen ovale to the left sacro-iliac synchondrosis, when the chin will necessarily move from the right sacro-iliac synchondrosis to the right foramen ovale, and thence, without assistance, beneath the symphysis pubis.

In the second position, the pressure must be against the left side of the head, in the same gradual manner during pains, so as to carry the os frontis from the right foramen ovale to the right sacro-iliac synchondrosis, so that the chin will rotate from the left sacro-iliac synchondrosis to the left foramen ovale, and then by the natural efforts under the symphysis.

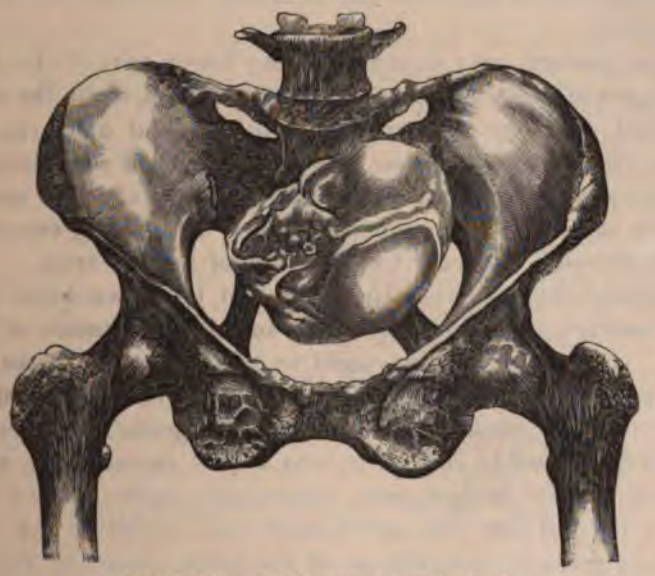
Another plan is to hook the finger into the mouth and make cautious traction in the proper direction during a pain, so as to aid rotation forwards. Others consider that rotation forwards may be best assisted by pressing the *occiput backwards* or the *forehead upwards* during a pain, thus causing a descent, and subsequent forward rotation of the chin.

Sometimes forward rotation of the chin may be brought about by the forceps. The latter should be straight or without the pelvic curve, though the double curved instrument may be used if removed at the proper time and replaced so as to keep the concavity always forward. Rotation by the forceps is generally difficult and injurious to the mother and often fatal to the child, chiefly by twisting its neck. When rotation forwards of the chin is found to be impossible we must resort to other means, such as endeavoring to bring down the occiput by the vectis or fillet, and thus converting a face into a vertex presentation; or if this fails to bring down the anterior part of the face, by the finger or forceps, so that the chin may slide over the perineum, and delivery in the mento-posterior or fronto-anterior position be effected. But the latter result would be impossible in a normal pelvis with an ordinary-sized child. If rotation cannot be effected, or delivery in the mento-posterior position be effected, we may, before resorting to craniotomy, try the plan recommended by the late Dr. John S. Parry, of Philadelphia, as published in the American Journal of Obstetrics for May, 1875. It consists in placing the

patient fully under the influence of ether, or some other anæsthetic, and then introducing the whole hand into the pelvis, and placing the thumb over the brow, and the fingers over the superior maxillary bone, and pushing the head forcibly upwards above the brim, when it may be flexed, and a fronto-anterior (or mento-posterior) of the face be converted into an occipito-anterior of the vertex, after which, if nature is not equal to the emergency, delivery may be effected by the forceps. Before resorting to the trephine and perforator, the forceps may of course be found useful as a tractor in other conditions besides those mentioned, even though we fail to rotate or bring the presenting part into the most favorable position for its use. But if all other means of delivery fail, craniotomy must be the final resort.

Presentation of the Os Frontis.—This is more commonly called a brow presentation. It may be divided into the first,

Fig. 79.



First Position of Os Frontis at Superior Strait.

second, third, and fourth positions, according to the point towards which the *middle of the parietal bones* looks. In the first position, for example, the middle points towards the *left foramen ovale* or acetabulum, and the *chin* of the child towards the right sacro-

iliac synchondrosis, as may be seen in Fig. 79. As this presentation is so exceedingly rare, I shall give a description only of the first position, which will answer all practical purposes.

Upon a vaginal examination, the head will be found in a state of demi-extension, and the frontal bone in the circle of the os uteri at the brim of the pelvis. The frontal bone may be distinguished by its rounded surface, and by its having in reach in one direction the root of the nose and the orbit, and in the other the anterior fontanelle. This is a more unfavorable presentation than either the vertex or face, into which it is often spontaneously converted. If, however, it descends into the cavity of the pelvis without changing into one of these more favorable presentations, the difficulties of labor are often very great and sometimes insurmountable except by destruction of the child.

TREATMENT.—If the presentation is recognized at the brim before the head has passed the circle of the cervix uteri we may, after dilatation of the latter has occurred, turn either by the head or the feet.

Upper pressure may be made on the lower part of the face by the fingers of one hand inserted into the vagina, while the occiput is pushed down by pressure of the other hand upon the hypogastric region, with the view of flexing the head and converting the presentation into one of the vertex. I have never seen any mention of the latter conjoined method, but having successfully tried it myself I believe it to be worthy of further trial.

Professor Hodge advises the occiput to be drawn down by the hand inserted into the womb after sufficient dilatation of the os uteri. He thinks that this ought to be done in all cases where the presentation can be made out in time for its accomplishment. Under these circumstance other authorities prefer podalic version. If it is found best to convert it into a face presentation, upward pressure must be made against the occipital region by one or two fingers inserted into the cervix uteri and carried to the vertex. By thus pressing the occiput of the fœtus closer to its spine, greater extension is obtained and the face is made to present.

If successful, the case must be treated afterwards according to the requirements of the induced presentation. If the os frontis has passed too far down in the pelvis for version, and our efforts at conversion into either a vertex or a face presentation do not

succeed the forceps must be tried. In their use we must consider the natural tendency of the face to turn toward the pubes, and for the superior maxillary bone to be fixed behind the arch of the pubis while the occiput passes over the perineum.

Of course if delivery prove impossible by all other means cephalotripsy or craniotomy will be necessary.

CHAPTER XXI.

PELVIC PRESENTATIONS.

UNDER this head is generally included all those cases where the pelvis precedes the body and head of the child in labor. It may be subdivided into presentations of the *breech*, *knee*, and *feet*, but as the mechanism and management of labor are substantially the same in all, it is more convenient to include them under a general description of pelvic presentations, and to consider subsequently any peculiar points in relation to the knees and feet that may suggest themselves. During the many centuries that elapsed from the time of Hippocrates until that of Ambroise Paré in the sixteenth century, it was the general belief among medical men that presentations of the pelvic extremity were abnormal, and required rectification by the introduction of the hand and turning by the head. Paré conferred as great a boon on midwifery by correcting this monstrous error, as he did upon surgery in substituting the ligature for hot oil, and the actual cautery, in controlling arterial hemorrhage after gunshot wounds and amputations.

PROGNOSIS TO MOTHER AND CHILD.—Many writers classify pelvic presentations under the head of preternatural labor, but the majority of authors at the present day include them under natural labor. They are certainly no more dangerous to the mother than vertex presentations, yet far more so to the child, the infantile mortality being according to Churchill 1 in 3½, but Dubois places it at only 1 in 11. A medium of these two estimates, or about 1 in 7, is probably nearer the truth. Even when the child is not still-born it is more apt to be seriously injured than in vertex presentations.

CAUSES OF INFANTILE MORTALITY.—The death of the fœtus in pelvic presentations is generally owing to the compression of the umbilical cord between its head and the walls of the maternal pelvis after the birth of the greater part of the body. The pressure thus produced has the effect of arresting the circulation of the fœtal blood to and from the placenta, and the pulmonary circulation of the child not having been established the blood fails

to be properly aerated, and the fœtus dies from asphyxia. Undue and long-continued pressure of the placenta against the fœtal skull by powerful tonic contractions of the uterus will lead to the same result, and so will premature separation of the placenta by uterine contractions during the expulsion of the body of the fœtus.

There is always danger of asphyxia to the child, if the birth of its head is delayed after the expulsion of its body. Footling cases are therefore looked upon as being attended with more risk to the child than breech cases, because of the imperfect dilatation of the maternal structures, in consequence of the small size of the feet and legs. But even when the umbilical cord or the placenta is not unduly compressed, or the latter detached, there is nearly always sufficient obstruction to the communication of the fœtal with the maternal blood, to cause the child, when expulsion of its head is delayed, to make efforts at respiration, and thus draw into its air-passages blood, or mucus, or other foreign bodies. Under these circumstances unless the accoucheur removes the child immediately it must die from asphyxia. The kind of assistance necessary will be mentioned under the head of treatment.

Causes of Pelvic Presentations.—It is highly probable that in some women a peculiar shape of the cavity of the uterus may be the chief factor in causing the pelvis rather than the head to present. The case cited by Velpeau of a breech presentation in six labors of the same person is very likely an example of this kind. In some others a deformity of the pelvis must be looked upon as the cause. An example of this kind is recorded by Dr. Randolph Winslow, in the American Jour. Med. Sciences, April, 1880, page 444; the case being that of a colored woman, with a deformity of the brim of the pelvis, all of whose ten children presented during labor at or near full term by the pelvis. All the children, except the fourth, were still-born. The woman being only thirty-one years old at the birth of her last child, December 2d, 1879, and her husband living, may yet add to the number of ten consecutive breech presentations. Yet it must be admitted that the causes of breech presentations as a general rule are unknown.

Frequency.—Pelvic presentations are far more frequent than those of the face, but much less common than those of the head. They occur about once in forty-five mature births. In Churchill's statistics of nearly two hundred thousand cases in French, German,

and British practice, the breech alone presented once in fifty-nine and one-third labors. Presentations of the feet are met with on an average of once in ninety cases. Knee presentations are extremely rare, occurring, according to Madame Lachapelle, only once in three thousand four hundred and forty-five instances of labor.

Diagnosis.—It is unnecessary to repeat here the diagnosis of pelvic presentations, as the subject has been sufficiently discussed in a former chapter.

Mechanism.—In accordance with a rule established in vertex and face presentations, we shall describe the breech as presenting in four positions, viz.:

First, or left sacro-anterior position, in which the fœtal sacrum looks towards the left foramen ovale of the mother's pelvis, and the breech occupies the left oblique diameter, with the left trochanter forwards.

Second, or right sacro-anterior position, in which the sacrum of the child points to the right foramen ovale of the maternal pelvis, the breech lies in the right oblique diameter, with the right trochanter forwards.

Third, or right sacro-posterior position, in which the fœtal sacrum is found to point towards the left sacro-iliac synchondrosis of the pelvis, with the breech in the right oblique diameter, and the left trochanter forwards. It will thus be seen that by allowing the sacrum to represent the occiput, the positions are analogous to those of the head, being named in regular order according to the part of the pelvis to which the sacrum looks. All writers agree that the first position of the sacrum, like the first of the head, is the most common; but while Playfair and others assert that the right sacro-posterior is the next most frequent, Leishman and other writers state that it is the least frequent of all the four positions. Leishman believes that the ratio of frequency of sacro-anterior to sacro-posterior positions is as three to one. The mechanism of head and pelvic presentations are analogous, but that of the breech is by no means so uniform as that of the vertex.

First Position of the Breech.—In this, the most common position of the breech, the fœtal sacrum points, as may be seen in Fig. 80, towards the left foramen ovale, and the back of the child looks forwards and to the left side of the uterus and pelvis, and its abdomen points backwards and towards the right side of the uterus and pelvis. The transverse or long diameter of the breech

corresponds to the left oblique diameter of the brim, while the sulcus between the buttocks occupies the right oblique diameter; the left buttock is the one most easily reached by the examining finger. Naegelé and his followers assert that the left hip lies lower in the pelvis than the right, but this is believed by most modern authors to be an error. The latter assert that the child's hips, like the head in vertex presentations, are not placed obliquely to the

FIG. 80.

First Position of the Breech.

brim of the pelvis. In other words, that the plane described by the transverse diameter of the hips, like that described by the biparietal of the head, does not dip down anteriorly lower than the plane of the superior strait, but parallel to the same.

DESCENT AND ROTATION OF THE BREECH.—The contractions of the uterus and accessory muscles acting upon the body of the child gradually force the breech through the cavity of the pelvis until it reaches the inferior strait, when rotation of the pelvis of the child takes place by its left hip moving forward on the right anterior ischial plane to or near the symphysis pubis, while the right hip passes behind the left ischial spine and rotates into or near the hollow of the sacrum, so that the transverse diameter of the child is brought to correspond nearly or completely with the antero-posterior diameter of the inferior strait, and its antero-posterior

diameter to the transverse diameter of the pelvis. The right hip is then found towards the sacrum, and the left hip behind, or nearly behind, the symphysis pubis.

The celebrated Naegelé denies this rotation; but the majority of obstetricians believe that, as a rule, it does take place, but not always, especially if the child is relatively small in comparison to the mother's pelvis, when the hips may be expelled through the oblique diameter of the inferior strait.

Birth of the Breech, Body, and Shoulders.—The breech having fully engaged in the pelvic cavity, the left hip will be felt just within the vulva fixed against or under the arch of the pubis, while the right hip describes the arc of a circle around the left one as a *point d'appui*, and glides over the distended perineum and is first expelled, immediately after which the left follows, thus forming a movement of flexion analogous to the flexion in face, and the extension in vertex presentations. This movement is shown in Fig. 81. Directly after the birth of both hips the feet slip out, unless

Fig. 81.

The Delivery of the Breech.

the legs are extended upon the abdomen of the child, after which the knees and body are soon expelled. The shoulders follow next in order, descending through the left oblique diameter of the pelvis to the lower strait, and then the left shoulder rotates forwards on the anterior right inclined plane under, or nearly under, the arch of the pubis, while the right shoulder passes back on the posterior left inclined plane into, or near, the hollow of the sacrum. The left forming a fixed point against the symphysis pubis, the right gradually distends the perineum and is expelled, followed instantly by the expulsion of the left. This part of the mechanism is delineated in Fig. 82.

If the arms remain in their normal folded position upon the chest they slip out with the thorax before the shoulders of the child are born. If on the contrary they become extended upwards on each side of the head, or one of them gets behind and below the occiput, the delivery of the shoulders and head becomes difficult, and sometimes impossible, until the arms are brought down again over the chest.

Meddlesome midwifery, especially improper traction upon the part of the child already born with the view of assisting nature, is

FIG. 82.

Birth of the Shoulders. (After Leishman.)

often the cause of this complication. For it must be remembered that in all breech presentations the natural attitude of the child's chin to its sternum is flexion, which is overcome by improper traction, and more or less extension produced instead; thus not only bringing longer fœtal diameters into relation with the mother's pelvis, but actually rendering an extension of the arms above the head more likely, by permitting the fœtal hands to slip between the chin and the sternum, and thence up the side of the head.

EXPULSION OF THE HEAD.—As the shoulders are being expelled through the inferior strait, the head with the chin flexed upon the sternum passes through the brim of the pelvis in the right oblique meter, with the forehead looking to the right sacro-iliac syn-

chondrosis, and thus descends to the floor of the pelvis. The occiput then rotates forwards on the left anterior inclined plane to, or nearly to, the arch of the pubis, while the forehead sweeps backward on the right posterior inclined plane into the hollow of the sacrum, as is shown in Fig. 83.

The nape of the neck becomes fixed under the arch of the pubis, while the head rotating upon its transverse axis causes the face to become more and more flexed upon the breast and to sweep over

FIG. 83.

the perineum—the chin being expelled first, followed in succession by the mouth, forehead, and arch of the cranium; and lastly the occiput makes its escape. The forehead and occiput frequently emerge from the orifice of the vagina simultaneously.

In its descent through the pelvis, the head, instead of being forced by the pains into a state of strong flexion, is sometimes partly extended, thus bringing longer diameters into relation with the pelvis, and rendering the labor more tedious and dangerous.

SECOND POSITION OF THE BREECH.—In this position the back of the child is also turned forwards, as in the first position, but, instead of looking towards the left side of the mother, or the transverse diameter of the hips being in the left oblique diameter, as, in that position, it looks towards the right side of the mother, and the transverse diameter occupies the right oblique diameter of the pelvis. Consequently the right buttock is the most easily

reached by the finger, and the right hip looks towards the left foramen ovale, and is the one to rotate forwards under the pubic arch, while the left turns in the opposite direction into the cavity of the sacrum, and describes an arc of a circle on the right, by sweeping over the perineum and being born, while the right remains fixed against the arch of the pubis, and only escapes after the left has made its exit.

The shoulders, too, occupy the right oblique diameter instead of the left oblique, as in the first position, the right shoulder looking towards the left foramen ovale at the brim, and during the descent, and on reaching the floor of the pelvis, rotates on the left anterior inclined plane under the arch of the pubis, while the left shoulder passes into the hollow of the sacrum, and the descent continuing, sweeps over the perineum, and is expelled a little before the right shoulder. The head, in the second position, occupies the left oblique diameter at the brim, and, during its descent to the outlet of the pelvis, when the occiput rotates forwards on the right anterior inclined plane under the pubic arch, where the nape of the neck remains fixed until the face, which, in the meantime, has rotated into the hollow of the sacrum, sweeps over the coccyx and perineum, and is born before the occiput, which, as in the first position, is the last to be expelled. So it will be seen that all the steps of delivery in the first and second positions are the same, except that the movements have a reverse direction.

Third Position of the Breech.—As the first and second are sometimes called dorso-anterior positions, so the third and fourth are designated dorso-posterior positions. The third is the exact opposite of the first position. The transverse diameter of the hips occupies the left oblique diameter, as in the first position, but with the right hip forward, and looking towards the right foramen ovale, instead of the left hip, as in the first position. The right buttock, or tuberosity of the ischium, being the most in front and the easiest felt by the examining finger.

The sacrum of the child points towards the right sacro-iliac synchondrosis, and the abdomen towards the left foramen ovale.

The birth of the body generally takes place precisely as in the first position, but in an inverse order so far as the hips and shoulders are concerned, the right hip rotating beneath the pubic arcade, instead of the left, as in the first position, sweeps over the perineum, and is expelled. The shoulders descend in the same oblique

diameter, and emerge from the vulva very much in the same manner as in the dorso-anterior positions.

The head next enters the superior strait in the right oblique diameter, with the occiput looking towards the right sacro-iliac synchondrosis, and the forehead towards the left foramen ovale. In the great majority of instances, labor is effected in this position by the occiput rotating forwards under the arch of the pubis; the rotation partly taking place with that of the hips, and the head being born as in the dorso-anterior positions. Occasionally, however, the more favorable forward rotation does not occur, but the occiput turns back into the hollow of the sacrum, and descending to the anterior border of the perineum, becomes fixed there until the face, becoming more and more flexed upon the sternum, emerges under the pubis, when the occiput slips over the perineum,

FIG. 84.

Delivery by the Breech; Disengagement of the Head. The Chin sliding beneath the Pubis, the Occiput remaining behind.

only after the face and forehead have been born, as may be seen in Fig. 84.

A second mode in which such cases of non-rotation forwards of the occiput in breech presentations terminate, is where the chin, instead of being flexed upon the sternum, is greatly extended, so that the face of the child looks upwards towards the brim of the pelvis, and its chin hooks over the upper edge of the pubis and becomes fixed in that position, while the back part of the head descends through the whole posterior part of the pelvis by a see-

saw movement, and distends the perineum, and emerges at the posterior commissure of the vulva, followed in succession by the vertex, the anterior fontanelle, the forehead, and lastly, the face. Such cases are extremely rare, there being only three or four on record, reported by Leroux, Michaelis, and Asdrubali.

Fourth Position of the Breech.—In this position, the sacrum of the child looks towards the left sacro-iliac synchondrosis, the abdomen towards the right foramen ovale, the left trochanter towards the left foramen ovale, and the right trochanter towards the right sacro-iliac synchondrosis, and the transverse diameter of

Fig. 85.

Fourth Position of the Breech.

the child corresponds to the right oblique diameter of the pelvis. This position is shown in Fig 85. The left tuber ischii is the most dependent. The mechanism of labor is the same as the third position, except that rotation of the fœtus takes place in the opposite direction.

Footling Presentation.—It is unnecessary to give a separate description of a footling presentation, as its mechanism is essentially the same as that of the breech. It may be stated, however, that on account of the smallness of the presenting part, rotation is rarely or never effected until the breech reaches the

the pelvis.

Super-rotation occurs in pelvic presentations, especially of the feet, oftener than in head presentations. For example, when the breech, in the first position, appears at the external orifice of the vagina, the sacrum may rotate from the first into the second position.

TREATMENT.—No other part of obstetrics has given rise to so much erroneous treatment as pelvic presentations. Even after the Hippocratic dogma that the birth of a child was impossible except by the head, which prevailed for so many centuries, had been exploded, such distinguished authorities as Hunter, Williams, and Smellie taught that, as a rule, the feet should be brought down in breech presentations. The modern rule is just the reverse, there being, however, exceptions, to be mentioned presently.

It is highly important that midwives and medical students should be instructed as much in what they must not do, as in what they should do, in the different varieties of presentations of the pelvis.

There is no emergency in the practice of the obstetric science where the temptation for injudicious interference is stronger than in the management of these cases; and none where more injury is likely to be inflicted thereby. It is very tempting to endeavor to hasten labor by traction on the partly-born trunk. But it should be remembered that by so doing an extension of the arms above the head, and of the occiput upon the spine are almost sure to follow, thereby vastly increasing the difficulties and dangers of the case.

While, therefore, it is our duty in many instances to render assistance, we should be careful to do so at the proper time, and in a judicious manner. A thorough knowledge of the mechanism of labor in breech presentations, and a proper diagnosis of the presentation of the child, are essential to a proper treatment of each case. As a general rule, in an ordinary breech labor no assistance is required until the expulsion of the breech.

It is especially necessary that the membranes should not be prematurely ruptured, as they are more essential than in vertex cases for a proper dilatation of the genital passages. Hence they must not be ruptured, as recommended in head presentations, so soon as the cervix uteri is fully dilated, but preserved until the breech descends to the pelvic outlet.

Whatever the original position, if the breech descends in a natu-

ral and satisfactory manner no assistance is required until its expulsion, when it should be received into the palms of the hands and supported, and during the rest of the labor either held well upwards or downwards, according to whether anterior or posterior rotation of the occiput occurs. Well upwards towards the abdomen when the natural and ordinary rotation of the occiput forwards occurs, and well backwards when the exceptional and abnormal rotation of the occiput into the hollow of the sacrum takes place, except in those extremely rare cases of posterior rotation of the occiput where the chin becomes hitched behind the symphysis pubis, when the body must be held up towards the abdomen, as in the natural occipito-anterior rotations in breech presentations. But even in holding the body upwards or downwards, according to the nature of the case, we must do so carefully, or the mechanism of labor may be obstructed instead of facilitated.

No aid is requisite because of the slowness of the descent, unless excessively so, for the slower the dilatation the more effectual it is likely to be, and the less danger of undue and dangerous retention of the after-coming head. In fact, until the birth of the nates, it may sometimes be proper, if the child descends too rapidly, to retard its progress by upward pressure against the presenting part. Thus, by preventing a too sudden emptying of the uterus, it will be the more apt to contract firmly upon the child; and thereby keep the head down, and the chin properly flexed upon the breast, so that it may the more readily pass through the pelvis, and the risks to the child from pressure on the cord while the head is being born be lessened.

Danger to the Child in Delay in Delivery of the Head, from Pressure on the Umbilical Cord.—Although pelvic presentations are generally more tedious than ordinary head presentations, they usually terminate without injurious consequences to the mother, but with great risk to the child, especially when the birth of the head is unduly delayed. In the latter event, the child may become asphyxiated from long pressure upon the umbilical cord between the fœtal head and pelvic walls. To obviate this danger to the cord it is proper, where the child is expelled so far as the umbilicus, to pull down a loop of the cord, and carry it to that part of the pelvis where there is the most room,—a point opposite the sacro-iliac synchondrosis corresponding to the side of the

fœtal head being usually the safest. By grasping the cord with the finger we may be admonished, from the character of its pulsations, of the necessity of operative interference. As a rule, so long as they are vigorous, the case may be left entirely to nature, unless other difficulties than ordinary delay present themselves, such as extension of the arms above the head.

Treatment of Extension of the Arms above the Head.—As a general rule, so soon as the child is born to near the shoulder, the arms slip out, but without any fault of the attending physician, one (as may be seen in Fig. 86, representing the mechanism of the second position) or both of them may become extended

Fig. 86.

above the head. This is a serious complication and requires rectification, not by pulling them directly downwards, or fracture of the bones would be the consequence. The accoucheur should, so soon as the shoulders are within easy reach, slip his finger over the posterior one, because there is apt to be more room then, pass it down to the elbow, which should be drawn over the face and anterior surface of the child, so as to liberate the forearm. The other arm may be pulled down in the same manner. When the shoulders are not easily reached, it sometimes becomes necessary to change the position of the child's body by properly applied pressure.

Facilitating the Expulsion of the Head.—If the delivery of the head is delayed, and the pulsations of the umbilical cord become very feeble, assistance is necessary. There are three princi-

pal methods; one or more of which may become essential, viz., Traction, Abdominal Pressure, and Application of the Forceps.

Traction.—This does not consist in seizing hold of the child and merely pulling, for this would result in extension of the arms, if not already born, above the head, and also extension, instead of flexion of the latter; two very serious complications. But while the body of the child in occipito-anterior rotation is grasped and held up towards the abdomen of the mother, the index and middle finger of the right hand are placed on the back of the child's head, so that their tips touch both sides of the base of the occiput, against which pressure is made in order to force the head into a state of flexion. We are advised by most authors to place the index and middle finger of the other hand on the superior maxillary bone, and depress it at the same time that pressure is made on the back of the head, but Dr. Barnes asserts that the depression of the occiput is sufficient. Flexion of the chin upon the sternum may also be effected by downward pressure upon the forehead by one or two fingers passed up the rectum.

Abdominal Pressure.—Either alone or in conjunction with traction in the manner described, pressure through the abdomen may be found highly useful. Of course where both methods are used simultaneously the assistance of another person is necessary. There is no danger by pressure upon the abdomen of producing extension of the head, if there are firm uterine contractions.

Application of the Forceps.—The accoucheur should never attend a case of pelvic presentation without having at ready command a pair of forceps, for although it is rarely needed for the extraction of the after-coming head, yet when the emergency for its use does arise the time lost in sending for this instrument, when not on hand, would be fatal to the child. I have on several occasions, in the practice of careless physicians, known the child to die from prolonged pressure of the cord between the fœtal head and maternal pelvis, when timely forceps delivery would have saved it. The method of application of the forceps will be described in Chapter XXXI.

Many accoucheurs advocate the use of the forceps in all cases of delay in the after-coming head; while others resort to it only after traction and abdominal pressure have been tried in vain.

Treatment of Sacro-posterior Positions.—In the management of sacro-posterior positions we must constantly bear in mind

the extreme importance of anterior rotation of the occiput of the after-coming head. This may be favored by the insertion of a finger into a fold of the child's groin and exertion during a pain of moderate traction and lateral pressure to the left or right, according to the position.

If by this means the transverse diameter of the breech be brought to correspond to the antero-posterior of the outlet, the shoulders will probably pass through in the same way, when the occiput, being thus changed from an occipito-posterior to an occipito-anterior, will the more easily and surely complete its rotation forwards under the pubic arch.

If nothing can be effected by this manœuvre, some accoucheurs recommend, after the birth of the shoulders, that the body of the child should be twisted around in the proper direction, with the view of aiding forward rotation of the occiput. But it is very doubtful whether the head could be made to turn with the body. If it could not, the result might be fatal to the child. The most sensible plan, and the one most likely to succeed, would be to press during a pain on the anterior part of the temple of the child in such a manner as to direct the face towards the sacrum, when a forward rotation of the occiput will occur.

Treatment when Occipito-anterior Rotation does not take place.—Where the natural and artificial efforts fail in producing forward rotation of the occiput, the accoucheur in order to facilitate delivery must bear in mind the necessity of aiding the natural efforts of flexion of the chin upon the sternum by upward pressure of the occiput with his fingers. Although flexion in one sense might be aided by carrying the body of the child upwards, this would defeat the effort of nature to cause birth of the chin, face, and forehead before the occiput.

Traction in an opposite direction, or backwards, is what is required so as to fix the occiput against the perineum, while the anterior parts of the head after due flexion emerges beneath the pubic arch. But a little caution must be exercised in this backward traction, or the chin instead of being flexed toward the breast may remain partly extended and be hooked above the symphysis pubis. The proper way to prevent this serious result seems to be to make pressure upwards of the occiput, as directed in proportion and in concert to the backward traction of the body of the child. Should the chin, however, in spite of our efforts be-

come so extended, and hitched above the symphysis pubis, traction on the body of the child must be made upwards, so that the occiput may glide over the perineum and be born before the chin and anterior portion of the head. In other words, the same treatment must then be used as would be adopted in an original case of this exceedingly rare complication. The forceps may always be found useful in these cases after the failure of other means, and before resorting to craniotomy.

Perforation of the Head.—In all cases of breech presentations, when other means have been tried in vain for the removal of the head, perforation of the latter behind the ear must be resorted to. After removing the brains, the skull may be crushed and removed by the cephalotribe or the forceps.

Treatment of Impaction of the Breech.—Our consideration of the management of pelvic presentations would be incomplete without a description of the resources at the command of the accoucheur for the relief of those very troublesome cases coming under the name of impacted breech presentations They are very rare.

A true impaction is where the breech passes down into the pelvis for a certain distance, and then owing to a disproportion between its size and that of the pelvis ceases to descend any further. Yet it is usual to include under this head those cases of long-continued retention of the breech from uterine inertia. These cases are often very difficult to manage.

When retention occurs from simple uterine inertia, abdominal pressure may be of slight service, but as regards ergot, sometimes found useful in delayed head presentations arising from uterine inertia, it does not seem to meet with a great deal of favor, although some physicians try it in order to arouse the dormant energies of the uterus. The principal measures employed by modern physicians are:

1st. Bringing down one or both feet when the breech has not descended too low in the pelvis.

2d. Traction on the breech either by the blunt-hook, fingers, fillet, or breech-forceps.

3d. Destruction of the presenting part.

If impaction of the breech occurs at or near the brim, the best measure is to bring down one or both feet, as by so doing we secure a control over the progress of the labor to be gained by no

other means. The woman must be put fully under the influence of chloroform, ether, or some other anæsthetic, and the hand should be carried over the abdominal surfaces of the child, and a foot or both feet brought down. When the breech is pretty low down in the cavity of the pelvis we are advised by some physicians to push it up so as to enable us to bring down the feet. This is a dangerous practice and does not meet with much approbation by the profession. Our chief and almost only resource when the breech is impacted low down in the pelvis is traction in one form or another.

The blunt-hook is the most powerful tractor. But its use is attended with so much danger to the child in the way of bruising and lacerating its tissues that it is hardly ever used nowadays except where the fœtus is dead. It is applied over the groins of the child. The hand of the accoucheur is by far the safest and best tracter. The index finger should be slipped over the groin upon the flexure of the thighs and traction used during the pains. If this proves insufficient a fillet may be tried. It must also be applied over one or the other groin. For this purpose a soft silk handkerchief may be used. But a skein of worsted is preferable. The most convenient and best way of passing it around the groin is to take a piece of copper wire with one end doubled in the form of a small ring, through which a tape attached to the fillet is drawn. It is an easy matter to pass this tape by means of the wire around the groin, and withdraw it from the ring, and then by pulling on the tape draw the fillet around the groin, the wire having been previously withdrawn. Or the reverse movement may be adopted of first passing the button end of the wire around the groin, and after running either the tape attached to the fillet, or the latter itself through the ring, withdraw the wire, when the fillet will readily pass into the desired place. Dr. Playfair recommends that the wire be bent at the end in the form of a hook, but I much prefer the ring shape, as it can be pushed around the groin or withdrawn much easier and with less danger of laceration of the soft parts of both mother and child than the hook. With a few exceptions, notably Professor Hueter, of Marburg, the use of the forceps in difficult breech labors has been condemned. But as already stated, Professor Miles, of Cincinnati, has contrived an instrument which he considers especially adapted for these cases. A description of it will be given in the chapter on "The Forceps."

In whatever way we render assistance, whether by first converting the case into a footling presentation or by traction, the natural mechanism of the breech labor should be constantly borne in mind, or our efforts at assistance will be fruitful of evil instead of good results.

Destruction of the Fœtus.—Having exhausted every known method of assistance in vain, embryotomy becomes our last resort. The presenting breech and other parts if necessary may be broken up by the scissors, craniotomy forceps, or other craniotomy instruments.

CHAPTER XXII.

TRANSVERSE PRESENTATIONS, OR PRESENTATIONS OF THE SHOULDER, ARM, OR TRUNK;—DISPLACEMENT OF THE ARM BEHIND THE NECK.

Some writers, recognizing the fact of there not being a single point on the human trunk that may not present at the os uteri, have described a great variety of cross, transverse, or trunk presentations, thus rendering a complex subject needlessly difficult of comprehension. It has been proved by experience that no matter what part of the body in a transverse presentation lies over the os at the very commencement of labor, as the latter advances the arm or the shoulder nearly always becomes the true presenting part.

The presentation now under consideration differs materially from the presentations of the head, face, and trunk in many particulars, but especially in the fact that whereas in the latter presentations the long diameter of the fœtus corresponds with that of the cavity of the uterus, in transverse presentations the long diameter of the fœtus, if not lying transversely at least lies obliquely to the uterine cavity. Among many other points of difference one more may be alluded to before going further. That is, that while in the presentations already discussed the birth of the child by the natural efforts is the rule, in transverse presentations it is the exception, hence the latter are often placed under the class of preternatural or impracticable labors. For the reason that in all the so-called transverse presentations it is the shoulder or the arm that generally presents at the commencement of labor, and that when exceptionally the thorax, abdomen, or back of the child lies at the os uteri at first, it is almost invariably changed very early in the progress of labor to the shoulder or arm, we shall confine ourselves to the discussion of *shoulder presentations*, including under this head the elbow and hand varieties, because the mechanism and treatment of them all are essentially the same. In accordance with the general plan adopted in presentations of

the head, face, and pelvis, I shall divide those of the shoulder into four positions, viz.:

First, or left dorso-anterior position.

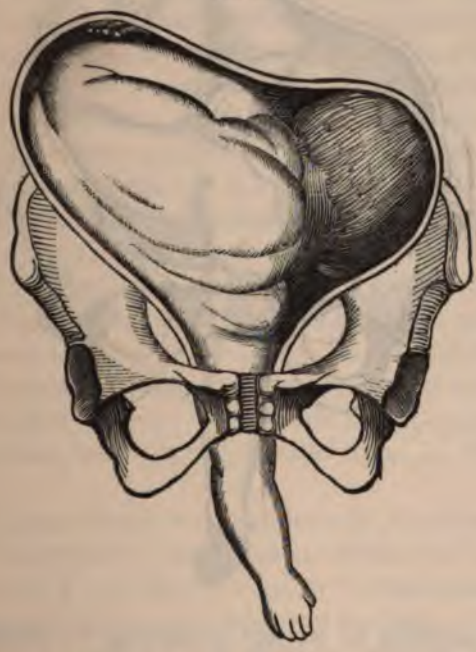
Second, or right dorso-anterior position.

Third, or right dorso-posterior position.

Fourth, or left dorso-posterior position.

In the *left dorso-anterior position* (Fig. 87), the back of the child looks towards the abdomen of the mother, its head lies in the left iliac fossa, and the right shoulder presents.

FIG. 87.



In the *right dorso-anterior position* the back of the child looks towards the abdomen of the mother, its head lies in the right iliac fossa, and the left shoulder presents.

In the *right dorso-posterior position* (Fig. 88) the back of the child is turned towards the spine of the mother, its head lies in the right iliac fossa, and the right arm presents.

In the *left dorso-posterior position* the back of the child looks towards the spine of the mother, its head lies in the left iliac fossa, and the left shoulder presents. The only objection that might be

urged against this classification is, that although there are four positions of a shoulder presentation, there are really only two of each shoulder. But as I fancy that the student can the more readily grasp and remember the practical bearings of the case by making the classification of shoulder presentations to conform to that of the natural presentations, I have adopted it, without, however, so far as I know, being supported by any authority upon the

FIG. 88.

subject; the majority of writers preferring to divide a shoulder presentation into two positions,—the dorso-anterior and the dorso-posterior—and to consider each as having a subdivision into two subsidiary classes.

POSTURE OF THE ARM.—In shoulder presentations the corresponding arm may lie in close apposition to the chest of the child, or it may depart slightly from it so that the elbow enters the cavity of the pelvis in advance of all other parts, or the arm may be entirely separated from the body and hang down in the parturient canal, and the hand sometimes passes externally to the pelvis, as may be seen in both Figures 87 and 88.

Frequency of Shoulder Presentations.—Shoulder presentations are a little less frequent than those of the face, and occur about once in two hundred and sixty cases. The most frequent position is the first, or left dorso-anterior. The two dorso-anterior positions are about twice as frequent as the two posteriors.

Causes.—It would be a needless waste of time to discuss the numerous theories of the causes of these presentations. They are various and somewhat obscure. The cause in some cases may be an excessive quantity of liquor amnii, in others an obliquity of the uterus, or a prematurity of the fœtus. The first and third producing the result in an indirect manner by allowing too much freedom of motion to the fœtus. Other causes are also spoken of, such as irregularity in the shape of the cavity of the uterus, particularly a relative increase in its transverse diameter; deformities of the pelvis; a short cord or its being twisted around the child; severe bodily exertion; falls; undue pressure upon the abdomen by stays; and a very low attachment of the placenta.

Prognosis.—So far as it regards any particular case, the prognosis will depend a great deal upon the period at which the malposition is recognized by the accoucheur, as well as upon his ability to render the proper assistance. If the diagnosis is made before the child is jammed into the pelvic cavity, and before the rupture of the amniotic pouch, the result ought to be good as a general rule. When, however, a reverse condition obtains, the prognosis both to mother and child, but especially to the latter, is exceedingly unfavorable.

Taking all cases together it may be said in general terms that the prognosis is infinitely more serious both to the mother and fœtus, particularly the latter, than in vertex presentations, and much more grave than even in face presentations. Churchill states "that out of three hundred and fourteen cases of presentation of the superior extremities, one hundred and seventy-five children were lost, or rather more than one half. Out of two hundred and eighty-two cases, thirty mothers were lost, or nearly one in nine.

Diagnosis.—For information upon this subject it is necessary to consult the chapter on the Diagnosis of the Presentations and Positions of the Fœtus; but it may be stated here that an early and accurate diagnosis is of the utmost importance.

Mechanism.—Unlike the three presentations already considered, a presentation of the shoulder has no regular mechanism of labor.

Still there are in this presentation two ways in which nature attempts, though generally unsuccessfully, to give birth to a child; and before we study the management of such cases it will be well to observe, and in a measure to be guided by, her method of overcoming the difficulties attending them. The natural terminations are spontaneous version (originally described by Denman under the name of spontaneous evolution) and spontaneous evolution, described at first by Douglas as spontaneous expulsion. Both these processes are so exceedingly rare that very little hope of the occurrence of either in a given case can be entertained. It is thought by some accoucheurs to be an impossibility unless the fœtus is premature, or very small relatively to the pelvic cavity. Yet it seems that there are a few undoubtedly successful cases upon record.

Spontaneous Version.—In this process the child is turned around by the natural efforts of the womb and accessory muscles so as to cause the presenting part to be withdrawn back into the uterine cavity, and either the head, or some part coming under the name of pelvic presentation, to be substituted in its place. It differs from spontaneous evolution in the fact that in the latter process the child is expelled by being squeezed through the pelvis along with the originally presenting part, which is not withdrawn as in the process of spontaneous version.

In spontaneous version the shoulder gradually rises up over the brim and is pushed to one side or the other of the pelvis to make room for either the breech or head, which takes its place in the cervix uteri, and the child is expelled. This process is practicable only when the child is at, or above, the superior strait. In this respect it forms another point of difference between it and spontaneous evolution, which may take place after the child has become jammed down into the pelvic cavity along with the presenting arm or shoulder.

Spontaneous Evolution.—The mechanism of this process differs essentially from that of spontaneous version, as the shoulder, instead of ascending as it does in the latter, descends more and more until it becomes fixed against the arch of the pubis, where it remains until the whole body of the child revolves around it as a centre and is expelled. (See Fig. 89.)

Either the head or the breech may be born first in spontaneous evolution, the birth by the breech being the most frequent. It is very doubtful if an instance of the former ever occurred except

with children born a month or more before maturity. In both varieties of evolution the originally presenting arm remains prolapsed, and so much pressure is brought to bear on the fœtus in its expulsion that its death is almost certain.

But it cannot be too fully impressed upon the practitioner that both spontaneous version and spontaneous evolution, nature's only modes of relief in shoulder presentations, are so exceedingly rare that no dependence can be placed upon them, and assistance must be granted sooner or later—the earlier the better chance of success.

Where aid is not given, after a tedious and imperfect dilatation

FIG. 89.

Spontaneous Evolution obtained from a Frozen Woman by Professor Chiara, of Milan, Italy.

of the os uteri, the membranes rupture and the arm descends into the cavity of the pelvis either primarily, or in the event of the shoulder originally presenting secondarily. The increasing uterine contractions gradually double up the child, and force down the presenting part as far as the mechanical conditions will admit, when further progress becomes impossible. The child at length dies, partly from long-continued direct uterine pressure of itself, and partly from interference of the circulation from pressure of the uterus upon the placenta. The mother also not unfrequently perishes, either at the time of labor, from rupture of the uterus, or subsequently from constitutional effects arising from sloughing of the soft parts, produced by the severe and long-continued pressure.

TREATMENT.—Nature, although generally powerless in her efforts at spontaneous version or evolution, dictates to the accoucheur the necessity of substituting for the presentation either the head or one of the varieties of pelvic presentation. If this can be accomplished the labor is generally not much more tedious and serious than in cases of primary presentations of these parts. The method of doing this is called turning—of which there are two varieties, cephalic and podalic. It may be accomplished either by external or combined external and internal manipulation, or by the latter alone.

A more full description of these various methods will be given in the chapter on Turning, but it is proper that a few remarks in elucidation of their application in shoulder presentations should be made at this time. An early diagnosis of the presentation, and, if possible, of the position, is essential to success. So is the precaution to make all examinations with the utmost care, in order not to rupture the bag of waters until dilatation of the os uteri has occurred, and also the necessity of standing ready to act at the most opportune moment. The best time for action is while the child is above the brim, and the membranes unbroken. Turning, by external, or by external and internal manipulation, is sometimes practicable at this time. Turning by the first plan might be adopted while we are waiting for the dilatation of the os uteri, and by the combined method after the dilatation, but prior to, or just after, the rupture of the membranes.

If the combined method is adopted prior to the dilatation of the os we might accidentally rupture the membranes before we are ready to try what is called podalic version by the introduction of the whole hand into the uterus. But if we wait for full dilatation before using the combined method, and the latter fails, we may at once proceed to the regular podalic operation by inserting the hand into the uterus with the palm towards the abdomen of the fœtus, and seizing and bringing down one or both feet. When the circumstances are favorable, the latter operation should always be preceded by an attempt at the external or combined method of turning. If the case is not seen until long after the liquor amnii has drained away, neither external nor the combined manipulation is applicable, but turning by the introduction of the whole hand into the uterus should be tried. The latter method should also be used in all cases where the internal and external methods have been tried unsuccessfully. Where there is insuffi-

cient dilatation of the os uteri, and the liquor amnii has already drained off, artificial dilatation of the same by the fingers, Barnes's bag, or some other substitute should be resorted to. Artificial dilatation of the os prior to the rupture of the bag of water is not advisable, because of the danger of rupturing the membranes.

Should the accoucheur not see the case until spontaneous version, or spontaneous evolution, is well advanced, and podalic version is impossible, he should aid the descent of the breech by traction on the groin, either by the finger, fillet, or blunt hook, the first being preferable.

ÆTHERIZATION.—At the time of turning, especially when the shoulder has descended into the pelvis and the body of the child is tightly embraced by the uterus, the patient should be put fully under the influence of chloroform, ether, or some other anæsthetic. Should the arm or hand be prolapsed in a case where the shoulder has descended low down in the pelvis, and the womb is contracted firmly around the child, no attempt should be made at its replacement. Anæsthetics may also be used in the event of embryotomy decapitation, or the Cæsarean operation becoming necessary. Of course the bladder and rectum must be emptied before any operation is undertaken.

DEATH OF THE FŒTUS.—If the accoucheur be called to a case of shoulder presentation where it is certain, from observation of the flaccid, pulseless cord, or the signs of actual putrefaction from peeling of the skin of the presenting part, that the child is dead, he should look to the mother's interest only in his means of relief. In this event if the child be jammed down into the pelvis, evisceration should at once be executed as the safest and best operation for the mother.

EMBRYULCIA, DECAPITATION, AND THE CÆSAREAN OPERATION.—When all other means have failed in effecting delivery and earlier when the child is dead, the difficult and dangerous operation of embryulcia, decapitation, or Cæsarean operation must be resorted to as an ultimate means of relief. The latter operation being preferred by American accoucheurs when it is certain that the child is living. Among British practitioners, however, the Cæsarean operation has never been very popular in any obstetric emergency, except as an absolutely last resort. They will allow of no election of it in preference to any other operation whatever. The reasons

for this difference in practice upon so important a subject will be given when we arrive at the discussion of obstetric operations.

Complicated Presentations.—A presentation of the head may be complicated with that of the hand, foot, or umbilical cord, or a combination of any two, or all three of them. Or the hands and feet, or one of each, may present either with or without the umbilical cord. Many of these presentations are varieties of transverse presentations, while in others the long axis of the fœtus corresponds with that of the uterus. A presentation of the hand and head is not necessarily a serious combination, for if the pelvis is unusually large, or the fœtal head unusually small, the labor ought to terminate without difficulty, and even where the fœtal head and pelvis are of normal dimensions, if everything else be favorable, a safe and natural parturition should generally be expected.

Even a presentation of a hand on either side of the head, or of a hand on one side and a foot on the other, would not produce an insurmountable obstacle to delivery. As, however, there is a chance of delay and protracted suffering in either of these complications, it is advisable to attempt a rectification of the same.

Treatment.—In rectifying a presentation of one or both hands with the head, or of a foot with a head, we must gently push up the hand, hands, or foot above the head in the intervals between the pains, and retain it or them there until the head alone descends and fills the pelvic cavity. The descent of the head may be facilitated by abdominal pressure. We must be exceedingly careful in pushing up the hand or foot not to displace the head. For if, unfortunately, the latter should be pushed to one side, and the shoulder engage instead, matters would be rendered more serious than at first. In order to avoid this difficulty it is sometimes better to wait until the head is about being engaged in the superior strait before we attempt to put up the complicating member. As it regards the complication of one or both hands with the head, if rectification prove impracticable, the hand or hands may be placed in that part of the pelvis where it or they would give the least obstruction to delivery, and we may then trust to the efforts of nature. Generally the best place is opposite the temple of the child. But if the pelvis is somewhat contracted, and the soft parts very resistant, turning by the feet should be adopted if the head has not, or the forceps applied when the head has cleared the superior strait.

In a treatment of descent of the feet and hands, or of one of each, either with or without the head, and especially with a prolapse of the umbilical cord, turning, by traction on the feet, either by the fingers or a fillet, will be necessary. If the uterus is not too firmly contracted around the fœtus, there will be no great trouble in effecting version by traction on the feet with the hand alone; but in some cases the child's mobility is so interfered with by the firmness of the uterine contractions that it becomes necessary to place a fillet around the ankle, and make steady traction upon this with one hand, while the arm of the child is pushed up with the other. An assistant may also render material aid in the meantime by external manipulation. That is, by drawing up with one hand pressed on the abdominal walls the cephalic end of the child, and pressing down with the other the podalic extremity.

Although, from great mobility of the child, we may in simple cases perform podalic version without the use of chloroform or ether, when the operation is likely from the known firm contraction of the uterus to be difficult, this agent becomes absolutely essential to relax the womb, as well as for the purpose of lessening the mother's suffering.

If turning cannot be effected we may, as in the more simple complication of the hand or foot under such an emergency, resort to the forceps. In fact, the only difference in the management of the simple complication of hand or foot, or both hands, with the head, and of the feet and hands, or one of each with the head, either *with* or *without a prolapse of the umbilical cord*, is that in the latter case we may first endeavor to return the complicating member, whereas, when the cord is prolapsed, it is better to resort to either podalic version or the forceps without delay. Of course, when the mother cannot be delivered in any other way, craniotomy on the Cæsarean section must be resorted to.

Prolapse of the Umbilical Cord.—We have had occasion to call attention to a prolapse of the funis in combination with other complications of labor, but as this is a serious accident in any presentation of the fœtus, even without any other complexity, the subject seems to demand further consideration.

Prognosis.—The mother suffers no additional risk from this complication, but it is far otherwise with the child, which dies in more than half of all the cases of labor. According to Dr. Churchill, the mortality is about fifty-three per cent. The mor-

tality being in presentations of the head, about sixty-four per cent.; in presentations of the shoulders, about fifty per cent. It is greatest in first labors.

The greater mortality in vertex than in other presentations is chiefly owing to the head filling the pelvis more completely, and thereby causing more severe, continuous, and prolonged pressure on the cord than occurs in other presentations, where the pressure may be comparatively light until the head enters the pelvis, when the great danger begins, but as the head, under these circumstances, passes more rapidly through the pelvis than when primarily presenting, the severe pressure is less prolonged.

Naegelé states that where prolapse of the cord occurs when the fœtal head is in the first position, the danger of pressure is much less if the cord lies towards the left sacro-iliac synchondrosis. As the danger to the child is from asphyxia, produced by the pressure upon the cord, it follows that the harder and more continuous the pressure, the greater the mortality. It is a wise precaution to notify the friends in a case of prolapse of the cord, of the threatened danger to the child; otherwise they might blame the accoucheur in the event of its death.

Frequency.—In an absolute sense, a prolapse of the cord is far more frequent in cranial than in any other presentation; but this is because of the great preponderance of the former over other presentations; for, relatively, it is much more frequent in face, pelvic, and transverse presentations than in those of the head.

According to Scanzoni's experience, the cord presented once in three hundred and four cranial, once in thirty-two face, once in twenty-one pelvic, and once in twelve transverse presentations. There is, however, a great difference of opinion in regard to the frequency of the prolapse. In a total of 90,983 fœtal presentations given by Dr. Churchill, we find one prolapse of the cord in every 282 cases.

Statistics show that it occurs more frequently in Germany than in England, and oftener in the latter country than in France. This difference is accounted for by Dr. Simpson by the varying positions in which the women are placed in each country during parturition. In Germany, where it is the most frequent, the woman occupies the dorsal position, with her shoulders elevated; in France, where it is the least frequent, she lies on her back as in Germany, but with her pelvis elevated.

In England, where we find a medium frequency, she lies on her left side, with no particular elevation of either extremity.

CAUSES.—Among the many alleged causes of prolapse of the umbilical cord may be mentioned an excessive quantity of liquor amnii, combined with a rupture of the membranes before the presenting part is fully engaged in the pelvis; an attachment of the placenta near the os uteri; great length of the cord; narrowness of the pelvis, especially a contraction at the brim. The latter cause acts by preventing a ready descent of the presenting part, so as to fill up the superior strait. The presentations of the child have a marked influence in the production of prolapse of the cord. Those favoring it the most, which least fill the pelvic brim, such as the breech, shoulders, and face.

DIAGNOSIS.—It is generally very easy to recognize a prolapse of the cord after rupture of the membranes, especially if the child be alive; but prior to this event, there is sometimes considerable difficulty, particularly when, from the death of the child, there is no pulsation. Although we can, under these circumstances, usually succeed in getting a coil of the cord between our fingers, and can recognize by the touch, even through the membranes, the nature of the presentation; yet, it is well to bear in mind that a prolapse of the small intestine, through a ruptured uterus or vagina, has been mistaken for the umbilical cord, with fatal results to the mother, and imprisonment of the unfortunate accoucheur. The annals of the British obstetric practice give several examples of this kind during the last thirty years. In most of the cases the medical attendants not only mistook the intestine for the umbilical cord, but what is more strange, deemed it necessary to cut it away—the death of the mother being the consequence.

TREATMENT.—The first question to be settled in a case of prolapsed cord is whether or not the child is living; for when it is dead no special treatment on its account is necessary.

PULSATION OF THE CORD.—Pulsation of the umbilical cord is, of course, positive proof of the life of the child; so is the absence of pulsation, when long continued, evidence of its death. But great care is necessary in determining the latter point. If we examine only during a pain, we are apt to be deceived, as the pressure upon the cord often checks, for the time, its circulation. Before absolute certainty can be reached upon this point, a careful inves-

tigation must be made continuously during several successive pains and the intervals between them.

Prevention of Pressure upon the Cord.—Having ascertained that the child is living, the chief indication in treatment is the adoption of some plan of removing the cord as much as possible from pressure. So long as the bag of waters remains unbroken, there is not apt to be much pressure. As its preservation is a great feature in the treatment, the plan of rupturing it so soon as the os uteri is fully dilated, must not be adhered to in any presentation complicated with a prolapse of the cord.

Postural Treatment.—This is most apt to succeed before the rupture of the membranes, but is applicable both before and after this event. A somewhat similar plan of treatment has been known for about forty years, but Dr. Gaillard Thomas, of New York, deserves the credit of making the profession generally familiar with it, and perhaps of rendering it more perfect.

Fig. 90.

Postural Treatment of Prolapse of the Cord.

It essentially consists in forming an inclined plane of the uterus, down which the cord may slip from its own weight beyond the reach of dangerous pressure, and there remain until the presenting part of the child is so fully engaged in the brim of the pelvis that there is no room for it to slip down between it and the walls of the pelvis.

Thomas's method, represented in Fig. 90, is to place the woman on her knees and elbows, with the former resting on a cushion, so

as to form a higher base than that upon which the elbows rest. The inclination of the plane may be made still greater by placing the patient on her chest and knees. The posture often proves very irksome, and even intolerable, and hence the same end may be gained by adopting the modification of it, recommended by Dr. Lumley Earle, of placing the woman on the side opposite to that of the prolapse, with her hips elevated by pillows, in such a manner as to form an inclined plane, with the waist resting on the lowest, and the hips on the most elevated point of the same. If the plan is adopted before the membranes are ruptured, so soon as the os uteri is sufficiently dilated, they may be ruptured, and the engagement of the head into the superior strait secured by pressure upon the uterus through the abdomen. This pressure would seem to overcome the principal objection to the method, pointed out by Dr. Leishman, that the posture in question, although tending to the gravitation of the cord towards the fundus, is apt, at the same time, to cause the head to retract from the lower segment of the uterus, and thus remove the most effectual barrier to prolapse of the cord. Dr. Leishman, however, is not opposed to the method, but thinks that it may be made most useful by combining it with the instrumental methods as suggested by Dr. Robert Barnes.

Manual and Instrumental Methods.—Postural treatment may be tried both before and after the rupture of the bag of waters, but manual and instrumental methods can only be used after the rupture, and may then be tried either alone or in connection with the former method.

Reposition of the cord by any of these methods, including the postural, is often unsuccessful in its results. Besides the difficulty and sometimes impossibility of getting the cord up out of the way of dangerous pressure, it is frequently impossible to retain it in its safe retreat until the presenting part is sufficiently engaged in the pelvis to prevent a recurrence of its prolapse. It may here be remarked that reposition and retention of the cord in any other presentation than the head is almost hopeless.

Probably the simplest and best manual method is to place the patient on the opposite side to the prolapsed cord, and then to draw the latter towards the symphysis pubis, as the shallowest part of the pelvis, and afterwards push it up with two fingers beyond the head.

There are many instruments for reposition of the cord, but besides being expensive and generally not on hand when most needed, they are no better than the more simple ones that can be improvised for the occasion. All the accoucheur needs is a male elastic catheter, which he should always have with him in obstetric practice, or a thin, narrow strip of whalebone, which any woman can furnish him from her corsets, and a string. The latter may be passed double along the canal of the catheter to its eye, through which its looped end must be drawn, and carried around a loop of the umbilical cord and back into the eye of the catheter, where it should be fixed by a stilet. The cord can then be pushed up beyond the head and held there by the catheter until the former is engaged in the pelvis, or the catheter may at any time be withdrawn by drawing down the stilet, and thus freeing the looped end of the string from the umbilical cord, which remains behind.

A more simple and easy plan of my own is to take a narrow piece of tape six inches long, double it, and tie the loose ends together, then carry the double string around a loop of the cord, and fix the two looped ends of the former in the eye of the catheter by the stilet, on the withdrawal of which, after the umbilical cord has been carried above the head, the double loop is freed from both stilet and cord. Of course the double loop of the string should be just long enough to properly girdle the cord without undue pressure. Another plan is to bore a hole through a catheter three-fourths of an inch from the tip. The loop end of a narrow silk braid or tape doubled may be passed through this hole, then around a loop of the umbilical cord, and afterwards hooked over the end of the catheter. The cord can thus be securely and safely held until it is pushed by the catheter above the head of the child, when a withdrawal of the catheter will cause the loop end of the string to slip off the end of the catheter, and thus free the cord, which may remain where placed.

Instead of a catheter, the strip of whalebone just alluded to may have a hole bored three-fourths of an inch from its end, through which the loop of a narrow braid or tape may be passed, and then around the cord and over the end of the whalebone; or the tape may first be made to encircle the cord, and then its two ends passed through the hole, and drawn through until the cord is loosely fixed near the end of the whalebone, which can be made

to carry it up far enough, when by pulling on one end of the tape it will be liberated.

In all these methods, except that of the short double loop, the tape must be long enough to reach when doubled from one end of the catheter, or whalebone, to the other. As previously stated, the above methods may be used alone, or in conjunction with the postural treatment, but if unsuccessful, the next resort is to turning or the forceps. The former when the child is above the brim of the pelvis, and the latter when it has descended too low down for turning. During the latter operation the cord should be placed near one or the other sacro-iliac synchondrosis, depending upon the position; in the left in the first and third, and in the right in the second and fourth position. Care must also be taken when the

FIG. 91.

Dorsal Displacement of the Arms.

forceps is used not to press it upon the cord. In roomy pelves, when the postural method of reposition has been tried unsuccessfully, it may be best to trust to the natural efforts of labor.

The plan of tying the cord to a sponge and then passing it up with the hope of the latter retaining it in position, or that of carrying it up with the hand, and hooking it over the shoulder or limbs of the child, is hardly worthy of description In conclusion,

I may state that there have been some experienced physicians who have failed so often in the various attempts at reposition of the cord that they have abandoned all artificial aids in prolapse of the same, and have trusted entirely to nature.

Displacement of the Arm behind the Neck.—Sir James Y. Simpson first called attention to a very rare form of complicated presentation, in which the forearm of the child is displaced across and behind its neck, as is shown in Fig. 91, thus forming an insurmountable barrier to a descent of the head into the cavity of the pelvis. An obstruction of this kind is very difficult of diagnosis, which can hardly ever be made out unless by careful exploration of the presenting parts while the woman is under the full influence of ether or chloroform.

Treatment.—Although we may succeed in bringing down the arm and converting the presentation into one of the hand and head, as recommended by Simpson, it is perhaps better, especially when the presenting parts are above the superior strait, to try podalic version, either by external or combined manipulation, and failing in these, to introduce the hand into the uterus and turn by the feet. Of course the cervix uteri must be dilated or dilatable, before either method of turning except the first is adopted.

Anæsthetics may or may not be brought into requisition, as in other cases of turning. In breech presentations, either primary or after podalic version, a like displacement of the forearm may occur, and create more or less embarrassment both in diagnosis and treatment. The latter consists in dislodging the arm by passing the finger behind the symphysis pubis, and over the shoulder of the child, the body of which should be carried well backwards in order to afford room for the operation.

CHAPTER XXIII.

OBSTRUCTIONS TO LABOR.

FIRST: FROM ABNORMAL CONDITION OF THE MOTHER'S SOFT PARTS.—Among the most common obstructions of labor from faulty conditions of the maternal parts may be mentioned the following: Rigidity of the cervix uteri; rigidity depending upon carcinoma, agglutination or occlusion of the os uteri; cicatricial hardening of the cervix uteri; abnormal contractions and obstructions of the vagina; rigidity of the perineum; varicose veins and thrombus of the vagina and labia; fecal accumulation in the rectum; hernial tumors; cystocele; distension of the bladder; stone in the bladder; uterine polypus; ovarian tumors, and fibroid tumors.

RIGIDITY OF THE CERVIX UTERI.—By this term is understood an undilatable cervix uteri, or one that dilates with extreme slowness and difficulty. There is a moderate form of rigidity in many women with their first children, especially if advanced in life. This is generally overcome by the action of the uterus during labor after a time more or less prolonged. But in the more obstinate form of rigidity under consideration or true rigidity, the os uteri either refuses to dilate at all, or dilates to the size of a silver half dollar or a dollar, and remains for hours and even days, in a thin, hard and unyielding condition, notwithstanding the strongest and most prolonged efforts of the uterus. The os and cervix instead of being thin and hard may become thick and tough from œdema, but will still remain very undilatable. This œdematous condition of the os and cervix is apt to occur in stout plethoric women, and especially where the head has been pressing down for some time after the escape of the liquor amnii, and must not be confounded with the soft and flabby state of the parts which naturally takes place in the process of dilatation in natural labor.

This form of rigidity may be due to constitutional peculiarities, particularly a highly nervous and emotional temperament, which renders all efforts of cervical dilatation extremely painful, or it may be owing to some organic alteration in the tissues of the uterus itself.

After the pains have continued for a long time without much or any further dilatation of the os uteri they become more and more feeble, because the patient's strength is gradually exhausted. Her tongue becomes covered over with a dry brownish coat, the skin hot, the pulse quick, and the parturient canal gradually loses its moist condition and becomes hot and dry.

These grave symptoms will set in much earlier where the membranes have been prematurely ruptured, and the presenting part permitted to press directly against the lower segment of the womb or cervix than when the bag of waters remains intact.

TREATMENT.—As serious symptoms are not apt to set in for a long time when the membranes remain unruptured, we may generally wait for nature to overcome the difficulty, or at least use the milder means at our command for her assistance, such as a warm bath, either general or hip, or what is better than either, though it may be used in conjunction, a warm douche to the cervix uteri by means of a continuous stream of water from a syringe, or douche bag, or vessel. There are many contrivances suitable for the latter. The warm bath or douche should be continued for about ten minutes at a time, and repeated every twenty minutes until the desired effect is obtained. We may also try the effect of a few fifteen-grain doses of chloral hydrate every twenty minutes, or the inhalation of chloroform or ether. If the patient has lost much sleep, and the pains are very severe and exhausting, a good dose of one of the preparations of morphia hypodermically, or by the mouth, often proves of great service. From one-sixth to one-third of a grain of acetate of morphia, combined with from ten to twenty grains of chloral hydrate in solution, may sometimes be given by the mouth, and repeated every two hours until the desired effect is produced, or several doses have been given with marked effect in producing a sound and refreshing sleep, and in relaxing the cervix uteri. After rupture of the membranes, and in urgent cases prior to this event, we may resort to manual or instrumental means of dilatation. The finger may be hooked in the cervix uteri and forward traction of the anterior part of the latter be made during a pain. This mode of treatment was at one time very popular in Edinburgh, but has been condemned by many accoucheurs. But although susceptible of abuse, it is doubtless under many circumstances an invaluable adjunct in the treatment of the troublesome condition under consideration. The cases most suitable for it are

where the head is low down in the pelvis and the bag of waters has long been ruptured.

Molesworth's Dilators and Barnes's Bags.—When the head remains high in the pelvis, or the membranes are unruptured, the finger cannot be used to any great advantage. Under these conditions in obstinate cases of rigidity it is better to have recourse to one or more of the caoutchouc dilators now so well known to the profession; such as Molesworth's dilators, or Barnes's bags.

By commencing with one of the smaller of these instruments, and substituting a larger size every fifteen or twenty minutes until the largest size, or it, in conjunction with some of the smaller sizes, has been introduced, we may succeed in obtaining a pretty rapid and full dilatation. The best thing for the distension of these dilators is water, although air may be used.

The old method of treatment in rigidity of the cervix and os uteri was by warm baths, bleeding from the arm, and the administration of large doses of tartar emetic; also the application of the extract of belladonna in the form of an ointment, or suppository, or solution in glycerin, directly to the cervix uteri. This application is not unattended with danger arising from the absorption of a poisonous quantity of the drug. It has long been a favorite remedy in France.

Incision of the Cervix Uteri (*Hysterotomy*).—Failing in all other means of relief, the accoucheur may incise the cervix uteri with a straight blunt-pointed bistoury, guarded by a wrapping of lint or adhesive plaster to within half an inch of the point, unless he can obtain a suitable blunt-pointed bistoury with only about half an inch of cutting edge.

The instrument should be guided under cover of the index finger, and three or four notches to the depth of a quarter of an inch be carefully made in the circumference of the os uteri. Generally the uterine pains will be sufficient to cause dilatation after the incisions, but if they have become inefficient, as is sometimes the case, from exhaustion, we may aid the dilatation by the dilators just mentioned, and if necessary administer ergot.

In a few cases either before or after incision, requiring very slow dilatation, it might be best to commence the process by the use of sponge, sea-tangle, or tupelo, tents. The method of using these various dilators and tents will be described under the head of induction of premature labor. After sufficient dilatation in head

presentations, if nature seems inadequate to complete the delivery, the forceps may be applied.

It was almost the universal custom of the older practitioners, and is the practice of the majority of the profession of the present day, to wait for the full dilatation, or at least dilatability, of the os uteri before resorting to the forceps. This rule is not followed by many of the more advanced accoucheurs, who do not hesitate to use this instrument in all urgent cases to which it is otherwise applicable, so soon as the os is dilated sufficiently for its insertion, even in cases of rigidity.

My experience upon this point would lead me to use it in preference to incision after chloral, chloroform, ether, and the fluid dilators have been fairly tried, and the os dilated to the diameter of about two inches, with no reasonable hope of a full dilatation before the occurrence of exhaustion or other dangerous symptoms to the mother.

I have performed craniotomy under these circumstances where the head was at the brim and the child dead, the mother recovering without any unpleasant symptoms. I have several times used the forceps in similar cases with perfect success, not a single bad symptom resulting therefrom. In fact where there is no other obstacle to the birth of the child than a rigid and undilatable os or cervix uteri, and the latter cannot be fully dilated by ordinary means, in time to prevent dangerous symptoms of exhaustion in the mother, I prefer the use of the forceps to all other instrumental methods of delivery, whether the child is living or dead, but especially if living, no matter whether the head be above or below the brim.

I performed the most of the operations just alluded to in opposition to the standard authorities of the time, but I am happy to see my experience confirmed by Playfair, and still more emphatically by Dr. A. K. Gardner, the editor of the American edition of Tyler Smith's obstetrics. Dr. Gardner, after enumerating and commenting upon the many objections urged by authors against incision of a rigid and undilated os uteri, and against the extraction of the child through it, uses the following language: "If, therefore, there be immediate necessity for any obstetric operation, do it irrespective of the local condition; *apply the forceps through an undilated os;* perform craniotomy through a but partially dilated os; and even,

if necessary, incise the os, in order to render an operation practicable."

The after-treatment in cases where incisions have been made requires careful attention to prevent the production of septicæmia from the absorption of fetid matter. Hence great cleanliness and the frequent use of disinfecting vaginal injections become necessary.

Rigidity depending upon Carcinoma.—Carcinoma is one of the most troublesome organic diseases to which the cervix uteri is liable; being no bar to conception, yet rendering the tissues of the cervix thick and hard, the rigidity produced thereby is generally insurmountable except by the use of the dilators, or incisions around the os, or both means combined. The liability of great hemorrhage from incisions in this disease must be borne in mind, and suitable styptics, such as perchloride of iron and Monsel's solution should be at hand.

Previous to any operation it is necessary to ascertain whether the child is alive, for, if dead, we may sometimes save a good deal of pain to the mother by reduction of the size of the child in any way to facilitate delivery.

Agglutination or Occlusion of the Os Uteri.—This condition is generally the result of inflammation of the cervix during the early months of gestation. Of course it could not exist in a complete form prior to conception, or this result would not occur. It is not generally associated with any rigidity or induration. The cervix will be found during labor to be thin, and to form a smooth, membranous-like covering to the presenting part, but the os may exist as a mere dimple, and be exceedingly hard to find.

It is occasionally necessary in our diagnosis to place the patient under the influence of ether or chloroform, and insert the entire hand into the vagina, so as to be able to explore carefully the entire lower portion of the uterus, as the os may sometimes be too high up, especially in a posterior direction, to be detected by an ordinary examination. The use of the speculum under these circumstances, although advised by some practitioners, is generally unavailable.

Treatment.—Having carefully made our diagnosis, the only treatment at our command is an incision, which should be slight and crucial and over the site of the os uteri if this is discovered, otherwise at some other convenient point in the stretched cervix

as nearly as possible in the natural position of the os uteri, or the incision may be made from before backwards, or several slight incisions may radiate from the real or supposed site of the os. Without great care the lateral incisions are liable to wound the uterine arteries, and the antero-posterior ones the bladder or rectum. If the uterine contractions are insufficient to complete the dilatation it may be assisted by Molesworth's or Barnes's dilators.

Cicatricial hardening of the cervix from former lacerations, and *hypertrophic elongations of the same* from disease prior to pregnancy, render dilatation difficult and sometimes impossible without assistance.

TREATMENT.—As the natural efforts are often sufficient to overcome the obstacles to dilatation offered by these conditions of the cervix, we should wait a reasonable time before rendering assistance, which essentially consists in the means enumerated under the head of treatment of rigidity of the os and cervix.

ABNORMAL CONTRACTIONS AND OBSTRUCTIONS OF THE VAGINA.—These may be congenital, or the result of inflammation before or after pregnancy. The inflammation may arise from various causes; one of the most common being laceration or other injury of the parts at a former childbirth.

I have seen instances of adhesion and contraction of the vagina as the result of injuries in labor, where it was impossible to pass anything larger than a probe; and one case of perfect atresia or occlusion of the vagina from the same alleged cause. There are all degrees of these contractions and obstructions, both congenital and acquired. Sometimes they consist in mere bands of adhesions drawing more or less closely together small portions of the vagina; or of bands simply thrown across the canal, at others of cicatrices involving more or less and sometimes all of the walls of the vagina.

TREATMENT.—If the physician is consulted concerning these contractions and obstructions of the vagina before labor occurs, it is well for him to remember that although nature is able to overcome all slight difficulties, yet that there are many where an operation of some kind is absolutely necessary before labor can be effected; and that when a case of the latter grade presents itself he is justified in using dilators even before parturition sets in. If he has no opportunity of doing so prior to labor, he must do so then. He may use as dilators bougies, sea-tangle, tupelo, or sponge

tents, and Molesworth's or Barnes's dilators. If these fail the bistoury, guarded with lint, except at the cutting part, must be used against the most obstructing parts. The operation may be repeated as often as necessary, and aided by the dilators when needful.

These various modes of relief may enable the presenting part to be born without further assistance. If not, then other aid is required, such as the forceps or craniotomy in head or face presentations, and the finger, the fillet, blunt-hook in the groin, the use of the breech forceps, or embryotomy in others. Of course conception cannot occur during complete atresia of the vagina, either congenital or acquired, but it occasionally happens that the occlusion takes place subsequently. If the atresia is almost perfect, but room enough left for the semen to pass through, conception may result. These cases are very difficult to manage, but a process of slight incisions and tearing at various points along the occlusion, combined with stretching the parts with the fluid dilators may ultimately succeed. Slight incisions are less dangerous from hemorrhage than greater ones.

In a case of atresia, incomplete before conception, but becoming complete during pregnancy, where no probe or sound can be placed along the vagina as a guide to an operation, a sound must be placed in the bladder as an approximate guide. The patient must be put fully under the influence of an anæsthetic, and be placed in the lithotomy position upon a strong table before a window furnishing ample light. The operation may then be conducted in the manner recommended by Professor T. G. Thomas for obliterated vagina in the non-pregnant woman.

"The labia being retracted by the fingers of two assistants, holding the thighs, the finger of a third, who kneels by the side of the operator, is introduced into the rectum. A steel sound is then passed into the bladder, which the assistant, on the left of the woman, holds in the right hand. At this moment this assistant holds the woman's knee under his left arm, retracts the labium by his left hand, and holds the sound in his right hand. The sound he must press upon gently, so as to let the operator's finger recognize its presence as it works its way up the vagina. By means of a pair of curved scissors, conducted up to the point of obliteration upon one finger, the tissue between the urethra

and rectum should then be very cautiously cut, in a transverse direction, and the finger introduced into the opening made.

"This is really almost all the cutting that should be done; the rest should be accomplished chiefly by the finger. This, by the sense of touch, tells the operator exactly how nearly he approaches the sound in the bladder on one side, and the finger in the rectum on the other. To one who has not tried this plan, the facility with which the adherent vaginal walls may be separated, or a new tract torn through the tissues, will be surprising. Now and then the application of the scissors or a curved probe-pointed bistoury will become necessary, but every such necessity becomes an element of danger."

Rigidity of the Perineum.—A certain degree of rigidity of the perineum is by no means an uncommon occurrence, especially among women of an advanced age, and in strong and muscular primiparæ, but it generally yields to the vigorous efforts of labor pains; yet there are occasionally very obstinate cases, particularly where the perineum has been injured during previous labors, and hard cicatrices have been formed in its tissues, where assistance becomes imperative.

Curative and Preventive Treatment of Laceration of the Perineum.—We may try the effects of lubricants and anæsthetics to relax the part, but if it fails to yield, and the pains continue strong, it is justifiable, according to Leishman and others, to make a slight incision in the margin of the perineum, on each side of the medium raphé.

If rupture then occurs it is supposed that its edges will be smoother and will consequently heal sooner than if the rip occurs without incisions; besides, the line of rupture being guided on each side of the middle of the perineum, is not so apt to extend into the rectum, as would be the case if it were left entirely to nature. However, prudence would dictate to the accoucheur not to be in too much haste to apply the knife, as great rigidity is often overcome by the efforts of nature alone.

Many eminent authorities, especially Goodell and Playfair, are opposed to the plan of making incisions into the perineum in all cases of labor where the tension is so great that laceration seems inevitable, except the tissues are hardened by previous cicatrization. Playfair does not indorse one of the principal reasons assigned for the incisions, "that a wound thus made is more apt to

heal readily than a lacerated one," because, in his opinion, a distended perineum is so thin that its rupture is always linear, and has edges as smooth as those of an incised wound.

The forceps is often useful in delayed labor from rigidity of the perineum, where the head presents. In presentations of the pelvis, traction by the hand, blunt-hook, or vectis, may be found of service. But a certain amount of extension, or, at least, dilatability of the perineum, is a prerequisite in this kind of assistance.

TREATMENT.—When laceration of the perineum occurs in labor, whether from rigidity, precipitate labor, or any other cause, it is recommended by most of the latest and best authorities, such as Demarquay, Baker Brown, Scanzoni, Simon, Thomas, Playfair, and others, that the edges of the wound should be brought together immediately, by a proper number of silver-wire sutures, no matter whether the tear be slight, or extend through into the rectum.

It does not appear that those who recommend this primary operation, insist on the same after-treatment as in the secondary operation, or as in cases where no operation has been performed, such as syringing out the vagina daily with tepid water, drawing off the urine two or three times daily, etc. These precautions, if not essential, are highly beneficial, and I have always adopted them.

The old method of treatment is simply to remove all blood-clots, place the woman upon her side, with her knees tied together, empty the bladder by the catheter, syringe the vagina gently with tepid water, once or twice daily, and use proper cleanliness for the parts, and prevent the discharges and urine, so far as possible, from interfering with the union, which generally takes place, in wounds of an inch or less. If it does not, then about three months after the confinement, the edges of the wound should be freshened and brought together, and retained by sutures for a proper time.

The precautions as to cleanliness, and drawing off the urine, given above, should also be followed. This plan of treatment still has many supporters. The advocates for the primary or immediate operation, claim for it much better success than by the plan of merely placing the knees together—in fact, healing almost invariably follows.

They also assert that immediately after delivery the perineum is not very sensitive to the insertion of sutures, the sensibility

having been deadened by the distension of labor. Besides, as extensive lacerations not unfrequently occur in the severe cases requiring instrumental assistance and anæsthetics, the necessary sutures can, under these circumstances, be applied before the patient has rallied from the effects of the anæsthetic.

This course is opposed by Tarnier (the editor of Cazeaux's Midwifery), by Roux, and Velpeau, upon the ground that the patients might recover spontaneously, and when they do not, the operation can be performed at some future time; generally several months after confinement.

There are other authorities, chief among whom are Nélaton, Verneuil, and Maisonneuve, who take an intermediate view of the subject, and think it best to operate a few days after the laceration, when hemorrhage has ceased, and the edges of the wound are covered by granulations.

It would be out of place in a work on obstetrics to describe the various methods of operation in those cases of ruptured perineum where cicatrization has occurred, but the accoucheur should know how to perform the primary or immediate operation, which consists simply in bringing the torn edges together and retaining them there by two, three, or four silver-wire sutures, applied by means of a needle set in a handle, or even by long needles held by forceps.

If the interrupted, twisted wire sutures are used, they should be passed about one-third of an inch from the edges of the wound, and the same distance apart. If a modification of the quilled suture is adopted, the wires should be inserted three-fourths of an inch from the wound, and about the same distance apart. In either case it is generally best to pass, at first, temporary silk sutures, which are used to draw the stronger, permanent silver ones into place. The ends of the silver-wire sutures may simply be twisted together, after the plan of Sims, or passed through four holes each, in two little rods of ivory, one on each side of the wound, and secured as recommended by Mr. James Lane (Cooper's Surgical Dict., 1872), or through three or four holes, in two little rods of hard rubber (recommended by Dr. J. H. Thompson, of Washington), and secured by compressed shot, or a twisted knot, as recommended by Dr. Thomas, and shown in Fig. 92. The quilled sutures are probably unnecessary, unless the laceration is very extensive and complete, and they should be supplemented by

a few more superficial and smaller sutures, to hold the cutaneous edges together.

Barnes thinks the deep sutures ought to be removed at the end of forty-eight hours (Thomas says on the third day), and the superficial ones in six, seven, or eight days. A somewhat similar rule might be adopted with the interrupted sutures if they are placed very deeply, and supplemented by superficial ones, to hold the edges of the skin in apposition; but, as a general rule, it does

FIG. 92.

Quill Sutures in Place.

not seem to be necessary to pass the interrupted sutures very deeply, or to assist them by superficial ones, hence they may be left in position longer.

After the operation the patient should be kept in bed, quieted by an anodyne, the bowels kept constipated, according to some authorities, but lax as advised by others, the knees tied together, the patient placed upon her side in order that the lochial discharge may flow through the superior vaginal commissure, instead of over the perineum, the urine drawn every six or eight hours, and the woman allowed to turn upon her back once or twice in every twenty-four hours, so that the vagina may be cautiously syringed out with tepid water. Union ought to take place in about eight or nine days.

Varicose Veins and Thrombus of the Vagina and Labia.—The veins of one or both of the labia, and any portion of the vagina may occasionally become varicose during pregnancy. The labia especially are prone to this condition, and not unfrequently become very much distended, by the time that labor occurs, so as to form an obstruction, which, however, is rarely very serious. This varicose state of the parts is chiefly of interest because of the danger of rupture of the distended vessels, from pressure of the child, and extravasation of the blood into the surrounding cellular tissue, forming what is termed a *thrombus*, which also arises from obstruction to the circulation of, and pressure on, the veins by the fœtus, even when no varicosity exists. In fact, in most of the recorded cases of thrombus, nothing is said about the veins being in that condition.

The extravasation may take place either during gestation, parturition, or subsequently. In the latter case it is supposed that the rupture really occurs during labor, but the pressure of the head prevents the effusion of blood until afterwards.

The period of most frequent occurrence is during labor, and particularly at the time when the head is pressing very low down in the pelvis, or is just passing through the inferior strait.

Situation of Thrombus.—The effusion of blood may be into one or both labia, or into any part of the cellular tissue of the pelvis. When into the labium, it sometimes creates a swelling so large and hard as to be mistaken for the head of the child. The hæmatic effusion may be diffused through the cellular tissue, around the vagina and other parts within the pelvis, or it may accumulate in cavities formed by itself. Its most common site is in one of the labia, or around the inferior part of the vagina.

A thrombus, when large, forms a great obstruction to delivery. The pressure to which it is then subjected, sometimes causes it to burst, and its contents, together with renewed hemorrhage, to pour out externally. The loss of blood under these circumstances is occasionally frightfully great.

Diagnosis of a Thrombus.—This tumor, depending as it does upon a rupture of bloodvessels, generally arises very suddenly. This is an important feature in diagnosis. At the same time the patient feels an intense tearing pain, extending down the thighs and through to the posterior part of the sacrum. The diagnosis is often uncertain if the extravasation is limited to the interior of

the pelvis; but where it occurs at the inferior portion of the vagina it is more certain; and where the situation is in one or both labia it may commonly be made out with certainty by an ocular and physical examination. It may, however, sometimes be difficult to differentiate between a thrombus and several other vaginal and vulvar tumefactions, such as a hernia, either of the omentum, intestine, or bladder, an inversion of the vagina, a descent or inversion of the womb, or a varicose condition of the parts.

The constitutional symptoms may assist in the diagnosis. At first they are chiefly those of loss of blood; but subsequently depend upon the termination of the sanguineous tumor.

Termination.—A thrombus may terminate by absorption without suppuration or rupture, by rupture before suppuration, or by suppuration and subsequent rupture.

Prognosis.—This is very grave. According to statistics given by various French authors nearly one-third of the mothers and children die.

Scanzoni and Fordyce Barker give a much more favorable showing in the cases reported by them. The latter author attributes the lessened mortality to the fact that the disease and its treatment are much better understood now than formerly. Sudden loss of blood is the most common cause of death, though many die from the ultimate effects of suppuration.

Treatment.—There is much difference of opinion concerning the treatment of thrombus before and after labor, but more agreement about its management during labor.

Leishman asserts that in those cases where it constitutes an actual obstacle to labor we must lay it open by a free incision. Cazeaux, Playfair, V. Saboia, Fordyce Barker, and others give substantially the same directions, except when the tumor is high up; but differ somewhat in the details of the treatment. The latter author insists on the application of the forceps immediately after the incision, and the use of styptics, such as liq. ferri subsulphatis, and antiseptics like carbolized glycerin, etc.

They all seem to think it best not to open small tumors (except perhaps Barker, who is not very clear upon this point), but to apply the forceps as soon as practicable and deliver at once.

When the tumor is opened or breaks spontaneously, the labor should be terminated immediately by the forceps, and cotton-

batting saturated with a solution of the subsulphate of iron, or a solution of perchloride of iron, applied to the bleeding surface.

Barker objects to the use of tampons under these circumstances, and insists upon the importance of not removing too soon the clots formed by the styptics, but of permitting them to come away of themselves.

The use of antiseptic washes in all cases where the thrombus opens spontaneously, or is incised, is necessary to prevent septicæmia. Carbolic acid mixed with glycerin or diluted Condy's fluid may be used for this purpose. So may a solution of salicylic acid, quinine, and boracic acid.

Fecal Accumulation in the Rectum.—Women are very apt, particularly during pregnancy, to allow their bowels to become very constipated. Occasionally they become so neglectful as to permit the accumulation of such a great mass of fecal matter within the rectum as to seriously impede the progress of labor.

Treatment.—A tepid enema of soap and water will generally free the rectum; but if it does not, owing to the hardened condition of the fæces, the latter may be scooped out with a spoon or the finger.

Hernial Tumors.—There are various hernial tumors which may obstruct the delivery of a child, such as a protrusion of the omentum or bowels into the vulva, called *vulvar or vagino-labial hernia;* a descent of the omentum or intestine into Douglas's space, called *vaginal hernia*, or a still further descent of one of these structures down between the vagina and rectum to the perineum, constituting *perineal hernia ;* a pressure of a portion of the rectum into the posterior vaginal walls, called *rectocele*, or of the bladder into the anterior part of the vagina, termed *cystocele.*

In regard to the hernial protrusions into Douglas's space, or the rectal, perineal, and vulvar herniæ, efforts should, when possible, be made to replace them by placing the patient in a suitable position and using pressure in the proper direction by the fingers. If all means of reduction fail, it is recommended to remove the child, when the head presents, by the forceps, when available, in order to prevent prolonged pressure upon the hernia and danger of mortification.

Cystocele.—A hernia of the bladder or cystocele consists of a prolapse or protrusion of the neck and lower part of the bladder covered by the anterior wall of the vagina in front of the presenta-

tion. It forms a fluctuating tumor of variable size. It probably is generally owing to the pressure of the presenting part, directly, or through the womb, on the fundus of the bladder, when more or less distended with urine.

DIAGNOSIS.—A cystocele may be mistaken for a hydrocephalic head or the bag of waters. The pain or tenesmus, however, is apt to put the accoucheur upon his guard, when he will find, upon careful examination, that his finger may be passed behind the swelling to reach the presentation, but not in front of it. The swelling will also usually disappear on emptying the bladder.

TREATMENT.—The bladder must be emptied by the introduction of a long elastic male catheter. Should it be impossible to pass the catheter in consequence of the urethra being dragged out of its normal direction, the bladder may be aspirated with a very fine aspirator trocar and canula, and its contents withdrawn, after which a reduction of the protruding viscus may be made in an interval between pains by properly applied pressure.

DISTENSION OF THE BLADDER.—A not uncommon obstacle to labor is a distended bladder. There is no duty more imperative upon the attending physician in labor than a careful oversight of the condition of the bladder, which may become so distended with urine as not only to form a serious impediment to delivery, but to endanger its rupture.

He must not rely upon information he may gain from the patient, or even the nurse, in regard to this matter, but should in all cases satisfy himself by an examination. He may be told, for instance, that the water passes freely and plentifully, but upon a more searching inquiry it may be found that it is only during a pain that a fluid so passes, and that the bladder is greatly distended.

Then again the woman may voluntarily pass a small quantity of urine frequently, and yet be suffering from distension of the bladder. Hence an examination must be made with the hands placed on the abdomen. If the distended bladder lies in the hypogastric region in front of the child, it is generally easy to distinguish it, but if it be displaced to either side there is more difficulty in the diagnosis.

TREATMENT.—The urine must be withdrawn by means of a soft gum-elastic male catheter. A silver male catheter may occasionally answer the purpose, but he who relies solely upon it will sometimes have the mortification of finding that when he cannot get

any urine from the bladder, another practitioner may by means of an elastic catheter draw off three or four pints.

If it be impossible to pass the catheter, and yet the bladder is so enormously distended that rupture is imminent, I presume that it would be admissible to draw off the urine by aspiration just above the symphysis pubis.

STONE IN THE BLADDER.—A vesical calculus may of course coexist with pregnancy, but it is only very rarely that it becomes so imprisoned in the lower part of the bladder by the head of the child as to become a serious obstruction to labor. The diagnosis of a stone may easily be made by the sound.

TREATMENT.—An effort should be made to push it above the brim of the pelvis, and then to press the child down so as to prevent its slipping back again. If unsuccessful in this we may endeavor to crush it, or to rapidly dilate the urethra and extract it. As the latter method frequently entails a long continuance of incontinence of urine some authorities believe that it would be preferable to perform the operation of vaginal lithotomy, provided delivery of the child by the forceps or turning be impossible.

FIG. 93.

Uterine Polypus as an Obstacle to Delivery.

UTERINE POLYPUS.—A polypoid tumor (Fig. 93), springing from the cervix uteri or other parts of the womb is, when large, apt to

nder parturition tedious, difficult, or impossible. If long-pedi-
ed it should be permitted to pass out of the vagina in advance
f the head, and not be removed until after the termination of
bor or the puerperal condition. When we have to deal with a
mor having a short pedicle an effort should be made to push it
bove the superior strait and to bring the child down either by
xternal pressure, the forceps, or turning. When the tumor is too
rmly attached to be carried before the presenting part, and too
rge to be pushed up, or for the child to be delivered by forceps or
urning, it must be removed by the écraseur during labor.

In cases where the tumor is not removed during labor it is an
ndecided question whether it should be removed immediately
hereafter or not for several months, when the puerperal condition
over. The advantages and disadvantages of either rule are so
ually balanced that there is no reason why the accoucheur should
variably adopt one in preference to the other. He must be
verned somewhat by the circumstances of the case.

The advantages of early removal are that in getting rid of the
olypus we free the patient from a source of constant irritation of
e uterus, resulting sometimes in exhausting and dangerous hem-
rrhage. Its chief disadvantage consists in the danger during
e puerperal condition of an operation, which has resulted fatally.

Ovarian Tumors.—Although ovarian tumors are rare they are
ore common obstructions to labor than bony growths, but less
equent than fibroid tumors. Their contents may be fluid, semi-
uid or solid. They may be situated on either side of the pelvis
r between the uterus and rectum. When an ovarian tumor is
ery large it rises with the pregnant uterus into the abdominal
avity, because there is no room for it in the true pelvis, but
umors of sufficient size to lead to serious obstruction in delivery
f the child, may descend into the pelvis in advance of the latter
Fig. 94).

Treatment.—As the pressure to which an ovarian tumor is ex-
osed, when prolapsed and obstructing labor, even when of only
oderate size, is liable during labor to set up a dangerous diffuse
flammation, it is considered good practice to puncture it, pro-
ded its contents are of a fluid nature, whether it be small or
rge, but especially when large, so as to lessen its size. If this
eration does not sufficiently diminish the tumor an effort should
e made to push it above the presenting part.

When these methods do not succeed, and in some cases where they do, the forceps or the cephalotribe should be tried. If these instruments fail we may try craniotomy, provided the tumor leaves an available space in the pelvis of about an inch and three-quarters. Should this operation be unsuccessful or not feasible we shall have to balance the chances between the Cæsarean operation, laparo-elytrotomy and extirpation of the tumor.

If it be possible to ascertain that there are no intimate adhesions of the tumor to the tissues and organs in its vicinity it might

FIG. 94.

Labor complicated by Ovarian Tumor.

be extirpated. But as certainty upon this point is generally impossible, laparo-elytrotomy (gastro-elytrotomy) or the Cæsarean section is our last resort.

Ovarian tumors, when not obstructing the pelvic canal, need not be interfered with during labor.

FIBROID TUMORS.—Labor complicated with the presence of fibroid tumors in any part of the uterus must always be watched with a great deal of anxiety, for even when these tumors are situated in the upper part of this organ, they interfere with its contractions both during and after labor, cause profuse post-partum hemorrhage, and render the uterus liable to rupture. They are, however, most troublesome when situated in the inferior portion

of the womb, because they are then very apt to obstruct labor by lessening the capacity of the pelvis for the passage of the child.

TREATMENT.—Our first effort in the treatment of an obstructing fibroid tumor must be to push it above the brim of the pelvis while the patient is under the influence of ether or chloroform. Failing in this, enucleation may be tried, provided that there is no reasonable hope of removal of the child by the forceps. If, from the nature of the tumor, enucleation cannot be accomplished, we may take into consideration the propriety of removing it by piecemeal with the écraseur. Of course the danger of hemorrhage and septicæmia are very great after such an operation. If all other methods of relief are hopeless, embryotomy or the Cæsarean operation becomes imperative.

ANTE-PARTUM HOUR-GLASS CONTRACTION.—This serious obstruction to labor consists in a constriction of the uterus in a somewhat similar manner to the same process occurring after parturition. The constricted part of the uterus seems to grasp the fœtus with such force that in some cases it prevents the fœtus from being delivered even by the forceps or by turning. In this curious, rare, and very dangerous form of dystocia a portion of the child lies above and the remainder below the circle of constriction, which is located, according to Dr. Hosmer, at the internal os uteri, though Dr. Robert P. Harris, who has investigated the subject pretty thoroughly, thinks that it is not limited to this point.

Dr. Harris also calls attention to the fact that although the credit of bringing this matter prominently before the profession is due to Dr. Hosmer, who in 1878 published two articles upon the subject, yet a somewhat similar constriction of the uterus had been described in Blundell's *Obstetric Medicine* in 1840. It does not appear, however, that Dr. Hosmer had ever heard of any cases previous to his own. Since the publication of his articles the subject has been enriched by the experience of other physicians, all confirming the formidable character of the obstruction. In reviewing the history of the published cases, Drs. Hosmer, Harris, and Playfair concur in the opinion that when it is impossible to overcome the constriction by chloral, chloroform, or the injection of atropine into the constricted part, turning should be resorted to, and if this fails the Cæsarean operation may be tried as a *dernier ressort*. Laparo-elytrotomy is not applicable, because of the im-

possibility of extracting the child through the constriction and cervix uteri.

SECONDLY: OBSTRUCTED LABOR FROM THE STATE OF THE FŒTUS.—Allusion will be made to only a few of the most important of these obstructions.

INTRA-UTERINE HYDROCEPHALUS.—This essentially consists in an accumulation of watery fluid within the cranium (Fig. 95). If the quantity of fluid is small the obstruction will not often prove

FIG. 95.

Labor impeded by Hydrocephalus.

a bar to labor, because the head is more compressible, owing to the nature of its contents. In consequence of this compressibility and a relatively large pelvis, very large hydrocephalic heads have occasionally passed through the pelvis without any manual or instrumental assistance.

FREQUENCY.—It is comparatively a rare disease.

DIAGNOSIS.—The diagnosis is frequently difficult, especially in pelvic presentations. Under the latter circumstances it can only be made out by an abdominal examination. In head presentations it is not so difficult, because the broad sutures and fontanelles and occasional fluctuation perceived through them tend to make it plainer. When, however, the head is arrested, as it almost always is, above the superior strait, even these peculiarities often remain unrecognized.

PROGNOSIS.—The prognosis is very grave both to the mother and child, the former frequently dying from rupture of the womb, or symptoms of exhaustion. The circumference of a normal fœtal head is about 13½ inches; hydrocephalic heads sometimes exceed twenty-four inches, and occasionally one of these enormous heads is found to so adapt itself to the pelvis as to be expelled by the efforts of nature alone. There have also been a few cases where from rupture of the head and escape of the fluid, the former has become so diminished as to be expelled by the natural efforts. But these favorable terminations are too rare for great reliance to be placed upon them when the head is much above the natural size.

TREATMENT.—As a child with congenital hydrocephalus almost invariably dies within a short period after birth, and as the risk of protracted labor, especially when the pains have been very hard, is great to the mother in the way of sloughing from inflammation caused by the pressure of the head in the pelvis, resulting in recto-vaginal and vesico-vaginal fistulas; and worse still, as death from rupture of the womb is a frequent termination of long delay in these cases, the practitioner must be prepared for energetic treatment. This consists, after a reasonable dependence upon the natural efforts, in tapping the head with a perforator, a small trocar, or an aspirator needle. Either of the latter two instruments may be used when the fœtus is living, and we desire to avail ourselves of the slight chance of its recovery after birth. But if the latter method does not suffice in withdrawing sufficient fluid to lessen the head so as to accomplish delivery, the perforator must be used, and the head extracted by the forceps, the cephalotribe or craniotomy forceps. In using either the small trocar or aspirator needle for the benefit of the child, it should not be inserted any further than is necessary to reach the fluid.

When the child is dead it may of course be removed immediately by perforation of the head and extraction as soon as there is sufficient dilatation of the os uteri, and the latter may, where the case is urgent, be artificially dilated.

As a rule, after diminishing the head by tapping, the operator may, if the pains are strong, trust awhile to the natural expulsive efforts before resorting to instrumental means of extraction. This rule is not so general where the fœtus is dead, and is of course not applicable when any emergency arises for immediate delivery.

The after-coming head in pelvic presentations should if possible be perforated in the occipital region, preferably behind the ear, but where this part cannot be reached an opening may be made into the cranial cavity through the orbit or the vault of the palate, or perforation of the spinal column may be made and a catheter passed into the vertebral canal in order to allow the escape of the intercranial fluid, as has lately been done in Tarnier's case.

External Hydrocephalus.—The malady just described is sometimes called true or internal hydrocephalus, in contradistinction to external hydrocephalus, or a collection of fluid between the pericranium and skull. This exceedingly rare disease is generally accompanied by an infiltration of the areolar tissue of the entire external surface of the fœtus, and by the death of the latter. Where it is not a complication of the true or internal hydrocephalus, it rarely seriously obstructs labor.

Treatment.—When it interferes with labor, the fluid must be evacuated by puncture of the scalp.

Hydrothorax, Ascites, and Distended Bladder.—The differential diagnosis between hydrothorax and ascites is very easy, for when the presenting part, the head or the pelvis, is expelled, and the trunk is arrested, there can be no difficulty in ascertaining whether it be the lower or upper part; but it is far more difficult to distinguish between ascites and a distended bladder.

Treatment.—If, after a reasonable delay, the natural efforts seem insufficient for delivery, the size of the part must be lessened by tapping, when expulsion will readily take place. As neither of the pathological conditions mentioned are necessarily fatal, a fine trocar or aspirator should be used. This is absolutely essential in tapping the abdomen, as a differential diagnosis cannot be made between ascites and a distended bladder.

Double Monsters.—Of the numerous kinds of monstrosity that give rise to obstruction during parturition, that of double monsters, or the union of twins, is practically of the most importance. There is an invariable law governing this union, which may be called the law of symmetrical anatomical fusion. Accordingly, we may find a union of occiput to occiput, or sacrum to sacrum, but never of occiput to sacrum.

Fortunately, double monsters are as rare as curious, for, when fully developed, they cause much trouble in parturition. Still, as all the world knows, they are sometimes not only safely delivered,

but grow up into manhood or womanhood, as the case may be. The celebrated Siamese twin brothers, Chang and Eng, will always be considered as a remarkable example of double monstrosity; so will the "Carolina Sisters," Christina and Millie. The former were united by the xiphoid region of the sternum, and the latter by the lower part of the backs, or at the sacral region. The "Siamese Twins" were born in 1811, in Siam, and died within a few hours of each other, in North Carolina, January 17th, 1874. Their mother, a Chinese half-breed, stated that they were born reversed, the first coming feet foremost, and the second with the head, and that they were probably immature.

The black twins, or "South Carolina Sisters," were born in the State of South Carolina, July 11th, 1851, and, like the Siamese Twins, have been exibited in all parts of the world. They are still living. I saw them in perfect health, in Portland, Oregon, in October, 1879. Their mother, having a large pelvis, is said to have had a brief and easy delivery. They are two individuals, morally, psychologically, and legally; one may talk French or sing, while the other is conversing in English, or crying or laughing; one may sleep while the other is awake, yet not for any great length of time. Both feel a touch upon the lower limbs of either. Their front legs are shorter than the rear ones, upon which they rest and walk, though they can walk upon all four legs, moving sideways. They have a single or common anus and rectum between the anterior limbs, but separate urethral and vaginal canals opening into a common vulva. For a full description of these remarkable creatures, see the *Boston Medical and Surgical Journal* for July, 1869.

Treatment.—No definite plan can be given for the management of double monsters during labor. Fortunately nature is generally equal to the emergency. The most favorable presentation is that of the lower extremities; consequently, when any other presentation occurs, if a sufficiently early diagnosis could be made, turning by the feet, when practicable, would appear to be indicated. Unfortunately, it is almost impossible to make out a diagnosis early enough for this method of treatment.

In footling cases, the bodies pass through the pelvis parallel to each other, and simultaneously, until the heads have descended to the superior strait, when it is impossible for both to enter at the same time. The indication under these circumstances is so to

manipulate as to allow the posterior head to enter the brim first. This object may be gained, or at least materially aided, by elevating the fœtal bodies well over the mother's abdomen. When both heads present, and the diagnosis of the union of the two children cannot be made out early enough for podalic version, we

FIG. 96.

Double Monstrosity (after Byford).

must encourage the plan generally adopted by nature in successful cases, and bring down the head of one a little in advance of the other.

When the head and shoulders are expelled, the remainder of the child may pass through by a kind of spontaneous evolution, and the second child is generally expelled afterwards, without much

rouble, feet downwards. Though sometimes it is better to apply he forceps and extract one head at a time, when the bodies will ome away simultaneously.

Bearing upon the subject, I make the following extract from he Proceedings of the Obstetric Society of London, April 7th, 880, Dr. W. S. Playfair, President, in the chair: "Dr. Godson howed, for Dr. Murphy, of Sunderland, a double monster, consisting of two female children, united by the front of thorax and ıpper part of abdomen. The first head was delivered by forceps; ›ody of first child extracted by hooking fingers over breech, then 'eet and body of second, and finally, second head. Both were ›orn alive, and breathed for a few minutes.

"The PRESIDENT remarked that the mode in which delivery ıere took place was a common one in these cases." This kind of ıonstrosity is represented by Fig. 96.

EMBRYOTOMY.—When delivery of both children is impossible, ne must be sacrificed for the benefit of the other. In this emerency, the practitioner should lessen the bulk of one of them in ny manner necessary to secure the birth of the other; unless oth be dead, which is generally the case, when mutilation of both nay sometimes be the easiest way to effect delivery.

CHAPTER XXIV.

THE MANAGEMENT OF NATURAL LABOR.

PROMPT ATTENDANCE.—There is nothing more imperative upon the accoucheur than a prompt response to an obstetric call. It is true, his patient may be nervous, and send for him long before he is needed, as is very apt to be the case in a first labor; or she may not be in labor at all, but only troubled with false pains; or, worse still, she may not even be pregnant, but only annoyed by the pains of spurious pregnancy; but, on the other hand, parturition may be so far advanced, or take place so rapidly that the practitioner shall arrive at the patient's residence in time only to render assistance, or perhaps, be too late. For, strange as it may seem, he can place very little reliance on the message received as to the urgency of the case. Moreover it might happen that, although labor had just begun, his assistance may be required to rectify a mal-presentation, like that of the shoulder, or a complication, such as prolapse of the umbilical cord.

If, upon his arrival, he finds, after a proper investigation, that his services are not required for some time, he can easily withdraw and return later. In cases of prolonged labor, the busy, but cautious, practitioner may occasionally find it necessary to repeat his visits over and over again. While it is seldom necessary for the medical man to remain in attendance upon his patient during the first stage of labor, his presence is generally required after the presenting part has passed the os uteri, and is pressing low down in the cavity of the pelvis.

FIRST DUTIES.—Although the practitioner should be prompt and diligent in answering to the summons of his parturient patient, he should not, of course, be flurried or excited on his entrance into the lying-in-chamber, or be abrupt in his inquiries concerning her condition and progress.

EXAMINATION.—If, as is commonly the case, he finds upon his arrival that the pains are not propulsive, he may busy himself for awhile in warming his hands and making general inquiries of the nurse or attendant as to the progress of the labor, and the pre-

ninary arrangements of the bed, and as to whether the patient
is had a movement of the bowels, or has passed water frequently;
make a few pleasant remarks upon some subject entirely foreign
the one for the investigation of which he was called, until his
tient becomes accustomed to his presence. Then he should pro-
se to her, either directly or through the nurse, the necessity of
examination in order to determine how she is getting along.
is seldom indeed that a woman in labor, however modest she
ay be, will refuse this most necessary request after she properly
derstands its importance. She may be placed in the English ob-
etric position, upon her left side, with her thighs and legs flexed,
upon her back, with her knees properly drawn up. The latter
the French and German obstetric position. The former is the
ore frequently used in the United States, except in cases of turn-
g or operative interference, when the dorsal decubitus is preferred.
many of the newer portions of our country the Continental posi-
n is selected for ordinary delivery. The woman should usually
near the right side of the bed, so that the practitioner may use
s right hand, but cases may arise where it is inconvenient to so
ace her, or where from injury this hand cannot be used, hence it
highly important for the accoucheur to accustom himself to the
e of either the left or right hand. In Germany an external ex-
nination, by inspection, palpation, auscultation, and percussion,
generally made in preference, or as a preliminary, to a vaginal
e; but the latter is in other countries, especially America, deemed
e first and most indispensable, to be supplemented of course by
ternal manipulation in doubtful cases. Either the index, or both
is and the middle finger, or the latter alone, properly warmed
d anointed with cold cream, sweet oil, lard, or cosmoline, may
carried to the vulva and gently inserted into the vagina.

There are various directions given as to the manner of reaching
e latter, but the practitioner's anatomical knowledge and com-
on sense will dictate to him the proper way of so doing, until he
s acquired some experience in this duty, when he will be able to
ss his finger straight to the part without any danger whatever
committing the blunder that Bedford so eloquently warns the
ung practitioner against, of inserting his finger into the anus in-
ead of the vagina.

The finger should be directed at first along the axis of the outlet
the vagina, and afterwards forward and upwards until it reaches

the os uteri, as represented in Fig. 97. Generally there is not much difficulty in finding the os with the index finger, but it is sometimes, at the commencement of labor, so high up and so far backwards as to require the introduction of both the index and middle fingers, especially if the fingers are unusually short. In this examination it is generally better to place one hand upon the abdomen while the finger of the other is in the vagina, so as to steady or press down the uterus upon the vaginal finger.

The physician in making a vaginal examination for the first time is like the blind man taking his first lesson upon raised type. He is compelled to rely entirely upon the sense of touch, which must

FIG. 97.

be cultivated before he can understand the meaning of what he feels. For it must be borne in mind that the examination should be made without the least exposure of the person of the patient.

The finger ought to be introduced during a pain, but the examination continued through the interval, or until the next pain, and longer if necessary.

IS THE WOMAN PREGNANT?—This is the first point to be settled; for, strange as it may seem, women are sometimes deceived as to their real condition up to their supposed full term of gestation, when labor will apparently commence, and the doctor be summoned.

Under these circumstances, if the latter fail to make a proper examination, so as to be enabled to undeceive his patient, the blunder will reflect most disagreeably upon his reputation. It is here only necessary to bear in mind the differential diagnosis between spurious and true pregnancy.

Is She in Labor?—The next most important question is whether she be really in labor. Here he will be obliged to differentiate between the so-called *false* and true *pains*. The former being irregular in point of frequency, severity, and duration, often commencing with great severity, and soon disappearing in a fitful, irregular manner, instead of commencing mildly, and regularly increasing in frequency, duration, and power. The false pains are more apt to begin in front, and the true in the back. The false make no perceptible impression upon the cervix uteri, or bag of waters, whereas the true pains cause the os to harden, to become thinner, and to slightly dilate during a pain, and the membranes to grow tense and slightly bulge out—like the convex surface of a watch-crystal, if the head presents, or the finger of a glove, if any other part occupies the cervix uteri.

As false pains may depend upon indigestible and irritating material in the alimentary canal, it is sometimes proper to administer a gentle aperient, either with or without an anodyne, or to give the latter alone. One of the salts of morphia, dissolved in some agreeable menstruum, such as spearmint-water, or water flavored with tincture of cardamom, or syrup of orange-flowers, will generally be found to be the most pleasant and efficient anodyne, although any of the preparations of opium, or chlorodyne will answer the purpose very well.

Presentation.—While ascertaining the foregoing points the presentation may be made out. If not, the examination should be continued still further, bearing in mind, however, that it is much better to wait awhile, and make another or even several examinations after parturition has been more fully established, than to run the risk of injuring the soft parts, or of rupturing the membranes at this early stage.

In the very commencement of labor we can rarely diagnose the position, and should be satisfied in ascertaining the nature of the presentation, when, if the head, we can in answer to the earnest inquiry of the suffering woman say, that everything is "all right." To the other interrogatory, which is always put by the patient or

her anxious friends, "*Doctor, how long before it will be over?*" the prudent physician ought to give an evasive answer, or he will most certainly, sooner or later, find his prediction most sadly fail. It is much wiser to reply, "My dear madam, as everything is favorable, you must endeavor to be patient, for the duration of labor depends so much upon the character of the pains that it is impossible to tell beforehand when it will end." If the accoucheur adopts the opposite course, he may find that it takes a good many happy guesses to *make a reputation*, but only a few unlucky ones to *destroy it*.

Position.—Of course, when labor has advanced sufficiently to render it possible, the exact position should be determined. This must be made out, by the relative situation of the sutures and fontanelles to the diameters and special points of the pelvis, as described in another chapter. After the full dilatation of the os uteri, if not previously, there is usually not much difficulty in the diagnosis by a painstaking, experienced physician. Yet it is remarkable how many old practitioners there are, who have never learned to make a proper diagnosis of the position of the fœtus, being satisfied when they have ascertained the presentation.

The Soft Parts—Capacity of the Pelvis—Obstruction from Tumors, or Fecal Accumulations in the Rectum.—By the *toucher* we are also enabled to ascertain not only the dilatation but the dilatability of the os uteri; whether there is rigidity of the latter or the perineum. Whether the vaginal canal is soft, moist, and unobstructed by adhesions or tumors, or fecal accumulations in the rectum. In regard to the latter point the accoucheur may be misled by the patient or the nurse. As an example, I may state that only a few days since, I was called to see a lady in her first confinement whose rectum was so full of hard fæces as to obstruct the vagina to such an extent that it was with the greatest difficulty that the finger could be inserted up as far as the cervix uteri. The midwife in attendance thought that "the birthplace had grown up." I pressed against the fecal matter through the walls of the vagina, and after thus breaking it up, washed out the bowel by repeated enemas of soap and water.

The capacity of the pelvis, and the presence or absence of deformities of the same, may be ascertained better by the finger, fingers, or in some cases the introduction of the whole hand while

e woman is under the influence of an anæsthetic, than by any her means.

Obstetric Bag.—Although it is unnecessary for the medical an to be incumbered with a large and expensive obstetric bag ery time that he is called to a case of midwifery, yet he will ot be in practice very long until he will see the necessity of aving at easy and instant command a male gum-elastic catheter, pair of forceps, a uterine syringe, some fluid extract of ergot, small quantity of the solution of perchloride of iron, or solution the subsulphate of iron, a little sulphate or other salt of morhia, some aromatic spirits of ammonia, and a vial of ether or loroform. These indispensable articles may be conveniently cked in an inexpensive leather case. For my own part I always ep two of these small obstetric bags, one at my office and one my residence, and two larger cases in addition. I never attend woman in confinement without taking with me one of the naller bags, and I have more than once had to congratulate myself upon this precaution. Not to multiply examples, I shall only ate that so far as the forceps is concerned, my views are not treme for or against its use, yet it has been only a few months nce I witnessed in consultation the loss of a child from detention of the after-coming head in a breech presentation, because the ysician in attendance had no forceps with him. A short time ereafter I had a similar case where the child was within an ace dying, but a prompt delivery by the forceps of the after-coming ead saved its life. In the latter example the cord had ceased to ulsate, and the infant, when born, was with difficulty restored to fe. If the forceps had not been on hand, its death from detention the head would have been inevitable, as I had tried all the rdinary means of delivery without success.

I am astonished that authors are not unanimous in insisting pon the absolute necessity of the accoucheur having with him, mong other things, a pair of forceps.

The Patient's Bed and Dress.—An intelligent nurse will see the proper preparation of the lady's bed and dress; but it is ecessary that the doctor should know how to supervise it, when ie nurse from ignorance or otherwise fails in her duty, or is bsent.

The bed should not be too soft. The best is a good hair mattress upon a tick filled with straw. Over the mattress should be

spread a soft rubber cloth, upon which a sheet must be placed. Under the hips of the woman a folded sheet should be laid. A good plan is to fold the sheet in two or three thicknesses and lay it lengthwise across the bed, so that it can be gradually pulled from under the woman as it becomes soiled from the discharges, and when the labor is over, removed entirely. The woman's night dress ought to be rolled up above her waist, and a soft flannel petticoat, opening all the way down, substituted as a covering for the lower part of the body. The bed-clothing should be adapted to the temperature of the room and season of the year. It will frequently become necessary to remove some of it from time to time as the woman becomes warmed from the exertions produced by the pains. At the termination of labor, however, it becomes necessary to replace the bed-clothing, and sometimes add a little to its thickness for a half hour or more, while the patient is cooling off. I do not remember any directions given in the books upon the latter point, yet my experience dictates its usefulness to prevent the patient's catching cold. Of course where post-partum hemorrhage is threatened, additional clothing must be used with caution, or not at all.

If the physician can control the matter, he should insist on the lying-in-chamber being well ventilated, large, and in a quiet part of the house, and being heated in such a manner that the temperature can be regulated without the danger of frequent and extreme changes. As a rule, the woman should be allowed to walk about the room or sit down at her convenience, during the first stage of labor. During the second stage she may take to her bed, but be permitted to rise up occasionally, or otherwise change her position. When the child has descended low down in the pelvic cavity and is advancing rapidly, and the propulsive pains are very strong, she ought to keep her bed.

The young practitioner must not be deceived by her frequent and sometimes frantic requests at this stage to get out of bed to have a passage from the bowels, but should tell her that it is the pressure of the child that causes the feeling of having a stool, and that she can have the latter in bed, if necessary. If under the circumstances she be permitted to get up, the child might be expelled into the chamber-pot or upon the floor.

Distension of the Bladder.—The physician must see that the bladder is properly evacuated at the beginning of parturition, and

hat it does not become overdistended during labor. It is sometimes the case, that even after a complete evacuation of the bladder t the commencement of labor and frequent micturition afterwards, that the urine accumulates, so as to interfere with the progess of labor and endanger rupture of the bladder itself. The best instrument for drawing off the urine is an elastic male catheter. The female catheter is sometimes, when the bladder is very much elevated or displaced by the presenting part, entirely oo short, and a metal instrument, whether male or female, cannot e inserted so easily as a flexible one, and is far more likely to roduce laceration of the parts.

The young practitioner must bear in mind in passing the catheer, that in the latter stages of pregnancy and during labor the rethra instead of being directed from before backwards, turns p behind the symphysis pubis in almost a vertical position, and ometimes becomes very much elongated, so that the catheter has o be passed from below upwards, and often for several inches inead of the normal distance of an inch and a half before the urine an be reached. This operation, when the presenting part, especially the head, is fully engaged in the superior strait, is occasionlly very difficult. Under such circumstances the woman should e placed upon her back, the catheter introduced in the absence f a pain, though when introduced it should be retained until the vater is drawn off, whether the pains return or not.

The process may sometimes be facilitated by pushing the preenting part backwards and upwards with the index and middle inger of one hand, while the instrument is introduced by the ther.

The medical attendant must not be too easily discouraged in his fforts to pass the catheter, for a failure might entail very serious esults to the patient, such as rupture of the bladder and death. his accident in labor from retention of the urine is rare, yet sufciently frequent for one physician, Ramsbotham, Senior, to obrve two cases. But even when the termination is not so serious here are many minor ill effects, such as paralysis of the bladder, edious labor, etc. The excruciating pain caused by the distended ladder is often so great as to prevent the voluntary contraction f the accessory muscles in parturition. When the urine cannot e drawn off by the catheter an aspirator needle should be intro-

duced into the bladder through the hypogastric region, and the organ thereby relieved.

A Primiparous Woman expects too much of her Attendant.—A woman in her first labor generally expects too much assistance from her physician, especially during the first stage, and is frequently too exacting upon his attention. Of course the attendant is in duty bound to aid the poor sufferer so far as in his power. But after having attended to the various preliminaries just pointed out, and being satisfied that the labor is normal, and yet not apt to be very precipitate, he may, if it is night-time and he has lost much sleep, lie down for awhile after giving instructions to the nurse to call him when the pains become strong and propulsive; or if in the daytime, and he has many other urgent calls, he might leave the patient occasionally for awhile to see some of his other patients. He ought, however, to be present about the time of the rupture of the bag of waters, for it sometimes happens that the child is expelled at this time. If it be not born at that period and the second stage is slow, he may even then leave his patient for a little while at a time, provided she has an experienced nurse, and a messenger to send for the doctor if the symptoms become very urgent. But as a rule, the medical man should remain, if not in the lying-in chamber, at least, in the patient's house during the second stage. If the physician stays with his patient all through the first stage she is very apt to consider it as an indication of either something wrong, or that labor will soon be over. If disappointed upon the latter point, she will be sure to demand impossible or unnecessary assistance. Still the question of the presence or absence of the medical man must always be well weighed. There are some instances where his occasional absence during the first stage is not only beneficial, but highly agreeable to the patient. There are others, especially with very nervous women, where it might be highly prejudicial. When he deems it proper to remain with the poor sufferer he should occasionally withdraw temporarily from the room to allow the nurse to place her upon the chamber.

Bearing Down.—It is customary for the nurse to urge the patient to shut her mouth and bear down during the whole period of labor. This practice is not only useless, but hurtful, during the first stage of labor. In the second stage, however, when judiciously used, it is beneficial. But even then the woman

should not be urged to exhaust herself in bearing-down efforts in the absence of pains, but should simply assist the latter when strong, but not strong enough. If, on the other hand, the natural bearing-down efforts are too powerful, especially when there is danger of rupture of the perineum from too rapid distension, she ought to keep open her mouth, and cry out if she desires, so that the accessory muscles, by not having a distended chest and contracted or depressed diaphragm as a *point d'appui* for downward pressure, will not much increase the expulsive action of the womb.

QUIETUDE.—The doctor should prohibit a loquacious nurse from detailing, as she is prone to do, all the horrible cases of sickness, injuries, and confinements that she has witnessed. All company ought to be excluded except the necessary attendants. If there is sufficient help without the husband, and the wife does not desire his presence, it is better that he should not remain in the room; for the chances are four to one that his natural sympathy for his agonizing wife may prompt him to some action detrimental to her progress.

TREATMENT DURING THE FIRST AND SECOND STAGES.—After having thoroughly diagnosed the presentation and position, and found the case to be perfectly normal, frequent vaginal examinations are unnecessary.

In a vertex presentation, when full dilatation of the os uteri has taken place, it is generally recommended that the membranes should be artifically ruptured by pricking them with a hair-pin, probe, or the finger-nail. The safest and best time for doing so is when they are rendered tense by a pain. In my opinion this should only be done so early when the quantity of liquor amnii is so great as to retard expulsion. I have often seen cases where the bag of waters was highly useful in dilating the vulva. Of course it should be broken before the birth of the child. When the latter comes to the world surrounded by the bag, the membranes must be opened immediately or the child will die from asphyxia.

It is well for the medical man to bear in mind that in many places, especially seaport towns, there is a superstition that any person born with the membranes over his head can never be drowned if these are dried and worn on his person as a talisman.

Much unhappiness may be caused to such persons and their friends of the same belief, if the doctor under the circumstances

does not direct the nurse to save the membranes, instead of destroying or throwing them away.

The use of anæsthetics will be more fully discussed under a separate head; but it may here be stated in a general way, that when the dilating pains are very severe a few, fifteen or twenty, grain doses of hydrate of chloral at intervals of about twenty minutes may be administered during the first stage, and given more abundantly in the second stage, unless ether or chloroform, or a combination of the two should then be preferred. These agents with others, and especially artificial dilatation by the rubber dilators of Barnes or Molesworth, are useful in the event of rigidity of the cervix uteri. But the treatment of this complication, and of others requiring the use of ergot, the forceps and turning, must be deferred for their appropriate heads.

The use of the first agent is fashionable with a few practitioners during the second stage of labor, when the pains begin to flag a little; and with some just before, and by others immediately after the birth of the child, and with others again, particularly Playfair, just after the expulsion of the after-birth, as a safeguard against post-partum hemorrhage.

In his deliberation upon this subject the practitioner should remember the danger of ergot to the child, when the latter is not born within a short time after the administration of the medicine. The drug is too powerful for evil to be given carelessly or as a mere matter of routine, and should be reserved for special emergencies. When hemorrhage really occurs, and in some cases where it is only threatened after the birth of the child, and before or after the expulsion of the after-birth, a few doses of some reliable preparation of ergot are often useful, as will again be mentioned under the treatment of hemorrhage. It is sometimes useful in hemorrhage just before the termination of the second stage of labor, especially if accompanied by inertia of the uterus, and may also be given for the latter condition alone. It is occasionally of service in twin pregnancy to hasten the expulsion of the second child. It must never be administered during labor unless the womb is fully dilated and there is no mechanical obstacle to the speedy delivery of the fœtus. It is, therefore, contraindicated in contracted pelvis, in transverse presentations, in most cases of obstructions from tumors, bony growths, impaction of the fœtus, hydrocephalus, rigidity of the os uteri or perineum, in plural

pregnancy, except to hasten the expulsion of the last child, and in a host of conditions coming under the head of obstructed labor.

ANTERIOR LIP OF THE CERVIX.—When the anterior lip of the cervix uteri is prevented from retracting by getting caught between the fœtal head and maternal pelvis, the physician should endeavor to push it up during an interval of pain, otherwise it might seriously retard the progress of parturition. He should be careful not to use much force. It is very apt to return unless held up by the finger until the succeeding pain.

LACERATION OF THE PERINEUM.—The fourchette is nearly always torn during primiparous labors. No harm arises from this slight accident. A ruptured perineum is, however, a more serious injury. The laceration may be very slight, or may involve the whole length and depth of the true perineum from the vagina to the rectum; or it may extend through the centre of the perineum without involving the vulva or rectum.

It is caused by the passage of the child through the external passages, especially in primiparæ and during precipitate labors, or when the child is very large, or when there is rigidity of the perineum. In some persons the latter will stretch enormously without giving way in the least, while in others it will tear almost like parchment.

PREVENTION OF LACERATION.—The means adopted to prevent laceration prior to Smellie's day consisted chiefly in the application of emollients and lubricants. He advised dilatation of the external vaginal orifice. Puzos advocated both lubricants and dilatation; and another author, pressing of the perineum towards the sacrum. Still later, or in 1781, we find Professor Hamilton, of Edinburgh, recommending lubricants and external support of the perineum from the time the presenting part commenced to press against it until the birth of the child. It is not known who originated the perineal support treatment, but from the time of Hamilton's recommendation until now, writers have generally advocated some kind of support, but vary greatly in regard to the degree and method. While some, like Ramsbotham, advise the practitioner to place his elbow against the bedstead, as a fixed point, and then allow the perineum to be forced against it; others, like Leishman, advise against all external support, as not only needless in all cases, but injurious in others. Hurtful, because the pressure of the hand against the perineum has a tendency to

produce reflex contractions of the uterus. This theory originated with Dr. Tyler Smith.

Goodell advises the perineum to be drawn forward during each pain by inserting the finger into the anus, and the propulsion of the head regulated in the meantime by pressure of the other fingers of the same hand against it. Playfair would carry out the same idea, not by inserting the finger into the anus, but by placing the palm of the right hand against the perineum in such a manner that the thumb would be on one side of the vulva and the fingers on the other, when the perineum may be pressed forward over the head, or in front of the head during severe pains, while the tips of the fingers may be pressed against the head at the same time, so as to retard its progress, if necessary, until the perineum is sufficiently relaxed.

Other authorities advise slight incisions to be made into the vaginal part of the perineum, on each side of its raphé, believing that an incised wound would heal up much more readily than a lacerated one. It is very doubtful whether the latter kind of perineal wound be more jagged or rough than an incised one, because the distension renders it so thin that it tears with a very smooth edge.

Of all the plans, very moderate support during the acme of the pain, with the palm of the hand placed against the perineum, seems to be the best. The hand should be so placed as to direct the presenting part along the perineal axis, and not backwards. The treatment for lacerated perineum is discussed in Chapter XXIII.

Management of Child.—On the birth of the head, in a vertex presentation, it must be supported in the palm of the right hand, while the other hand is placed upon the abdomen, and moderate pressure exerted upon the womb until the expulsion of the child. If, upon the birth of the head, the umbilical cord is found wrapped around the child's neck, it must be gently drawn down, and either slipped over the shoulders or head. Unless this be promptly executed, the child may die from asphyxia. There is a slight temptation in head as in pelvic presentations, to endeavor to hasten labor by pulling on the part first born. The objections to this kind of meddlesome midwifery were stated in the chapter upon pelvic presentations. It is only important to remark here that aid of this sort is rarely proper or useful in head presentations. Exter-

nal pressure through the abdomen is all that is necessary in the vast majority of instances. Yet, in a few cases, where asphyxia is threatened after the head has been expelled, the fingers may be hooked into the axillæ, and gentle extraction used. The reader will remember that in pelvic presentations, as a rule, when a child is born with the occiput to the symphysis pubis, its body must be gradually elevated as the head is being expelled; and the reverse movement of carrying the body backwards is necessary when anterior flexion of the occiput does not occur. The only exception being those very rare cases of non-rotation forwards of the occiput, where the chin hooks behind the symphysis pubis, when it is better to elevate the body and let the occiput sweep over the perineum before the expulsion of the face.

Ligature of the Cord.—As soon as the child is born and respiration of the lungs is established, the umbilical cord should be tied about an inch and a half from the navel, and again, an inch nearer the placenta, and then cut between the two ligatures. The second ligature is deemed unnecessary, and even detrimental, by a few authors, who consider that the few ounces of blood lost by the placenta when this ligature is omitted, enables the afterbirth to be expelled more readily, and with less suffering to the patient. Other authors take an opposite view. The most important reason, however, for the second ligature is that, occasionally, there may be a twin pregnancy with a common or single placenta; in which event, if the ligature is omitted, the second child may die from hemorrhage.

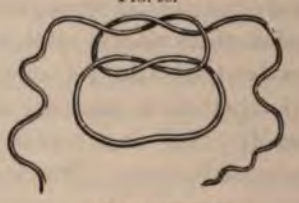
So far as I am aware, there is not a single author who advises his readers to take with them *their own ligatures*, and to use the *reef-knot*. This seems to me an extraordinary omission, and one that has cost the loss of many children. I knew a physician who was singularly unfortunate in having the cord to bleed in defiance of his ligature; and once the hemorrhage proved fatal. In a spirit of despondency, he asked me whether I could enlighten him upon the cause of his misfortune, and whether it were possible that all his cases were owing to the want of a normal circulation, such as sometimes occurs in the new-born child, where a portion of the blood continues, as in fœtal life, to rush through the foramen ovale of the heart, the ductus arteriosus, and to keep open, and fill the umbilical arteries for a longer period than usual, instead of allowing these and the other peculiar anatomical struc-

tures of fœtal circulation to collapse, and become gradually obliterated.

Fortunately, I found out that he was in the habit of using unwaxed silk ligatures, and tying a common loose knot. I instructed him to try very strong, narrow silk braid, and after encircling the cord twice for the ligature nearest the child, to make a reef-knot. It is sometimes called a square knot. He followed my advice, and was never after troubled with hemorrhage.

The advantage of always keeping a supply of ligatures on hand is that we are thus enabled to select them with due regard to proper thickness and strength, and have them ready for the emergency. The ligature should be strong, so that it may be drawn sufficiently tight to completely and permanently obliterate the umbilical arteries, and must be thick enough not to cut through the coats of the latter; for if it should, hemorrhage might result

FIG. 98.



(After Gross.)

If the ligature be very thick or weak, it may not be possible to constrict the umbilical arteries, particularly in a very thick umbilical cord, sufficiently to prevent secondary hemorrhage so soon as the cord becomes diminished by the escape of its fluid contents. Ordinary tape is too wide, and common thread, whether cotton or linen, too weak and incisive. The best material for a ligature is very narrow silk braid. This, as before stated, must be drawn tightly, and secured by a reef-knot (Fig. 98). The ends of the ligature in this knot lie across the umbilical cord, instead of being parallel with it, as in the ordinary loose knot. The reef-knot has taken the place of the old-fashioned surgeon's knot (which is different from the loose knot), in all operations of ligation in surgery.

I am aware that the cord may be torn off, or severed with a pair of dull scissors, several inches from the umbilicus, without always being followed by dangerous hemorrhage, even when un-

ligated; but my experience demands the greatest care in securing the cord.

A few physicians have recently revived the method recommended by Cazeaux and older authors, of squeezing the stump of the cord between the thumb and forefinger until all the jelly-like substance is removed, and of subsequently tying it. They claim that there is less danger afterwards of hemorrhage or umbilical hernia, and that the cord dries up and falls off quicker than by any other method. I have tried this plan, but perceive no advantage in it. In truth, the tendency to umbilical hernia, and hemorrhage from the navel, seems to be increased by the removal of Wharton's jelly, and the too rapid exsiccation of the cord. When this method is adopted, no dressing is recommended for the umbilical stump, or bandage for the infant. Under these circumstances, the cord is apt to soil and stick to the under garments of the infant, and might readily be prematurely pulled off by the nurse in changing the infant's dress. Moreover, a soft flannel binder to the child, acts as a preventive of colics and other maladies. Of course, it should not be applied too tightly. There are various ways of dressing the cord. The plan I have generally adopted is simply to place a small strip of muslin, greased with fresh lard, sweet oil, goose-grease, or cosmoline, on the abdomen, to bend the stump on this, and lay another piece of cotton cloth over all. It is much easier to keep the parts clean by this method, and to replace the dressings, if necessary, before the cord falls off, than by the old orthodox plan of slipping the cord through a hole in a strip of muslin, and folding the latter upon it.

Suspended Animation.—If the new-born infant does not cry out, or show other evidence of the establishment of a complete, independent respiration, means must be adopted to arouse its lungs to a proper action. Under these circumstances, if the cord continues to pulsate, it is generally best not to tie or cut it until we have tried some of the most efficient means of stimulating the lungs to action, as there is a possibility of a slight amount of placental circulation, or sufficient to be of service until the independent circulation can be aroused into full play. Among the host of stimuli to reflex action of the respiratory muscles, we may try blowing on the face, dashing, alternately, warm and cold water over the face and chest; slight flagellation of the chest with a towel, wet in cold and warm water, alternately; rubbing the

child; drawing the tongue forwards, and freeing the fauces of mucus, then using Marshall Hall and Sylvester's method of artificial respiration, and a later plan of alternately flexing and extending the body of the child in a rhythmical manner; of dipping the child first into a warm, and then into a cold bath; or placing it in a basin of warm water, up to its chin, and occasionally elevating its chest and abdomen above the surface of the water, and slapping them with a towel, wet in cold water; by rubbing mustard over it, wet or dry; or applying the faradic battery. In order to use some of these restoratives conveniently, it may be, come better to tie and sever the cord in a few minutes after birth and sooner, if the placental circulation ceases.

After the child is born the nurse usually anoints it all over with lard or olive oil to soften the *vernix caseosa*, or cheesy varnish, with which its skin is almost invariably covered, and then washes it with castile, glycerine, or some good shaving soap, and warm water; then dries it with a soft towel, and dresses it. A good plan after washing and drying it is to rub a little sweet oil, lard, or cosmoline all over its body. Some accoucheurs do not permit the nurse to apply soap and water to the recently born infant, but direct it to be covered all over with warm sweet oil, and then wiped with a soft towel sufficiently well to remove the vernix caseosa. I can perceive no objection to this plan, but do not see that it is preferable to the other methods.

The Third Stage.—While the nurse is attending to the infant the medical man should see to the delivery of the after-birth. The old orthodox method of assistance in expulsion of the placenta consisted mainly in gently pulling on the cord, first in the direction of the axis of the superior strait, and afterwards in that of the lower. The natural result of this method is to turn the placenta inside out, like an umbrella in a storm, so that when being expelled its fœtal surface becomes outside and its maternal inside, thus rendering the woman more liable to hemorrhage, because as the inverted placenta descends along the parturient canal it creates behind it a vacuum, which sucks the blood out of the open sinuses like an exhausted cup when applied to a freshly scarified surface of the body, only far more abundantly.

Credé's Method.—Instead of a *vis a fronte* drawing out of the placenta, as generally practised until lately, a *vis a tergo* expulsion is now becoming the favorite mode. This manner of dealing with

he placenta has been known to a few physicians for a long time, having been the common method among our Indian tribes, but has only lately, under the name of "Credé's Method," attracted much attention. It consists essentially in grasping the fundus of the uterus by the left hand, so that either the ulnar side of the hand or the tip of the fingers is pressed well behind the fundus, and the latter rests in the hollow of the hand, when firm pressure is made downwards and backwards in the axis of the superior strait (Fig. 99). In this manner the womb is not only excited into action by the pressure, but aided in its expulsive efforts.

FIG. 99.

Illustrating Expression of the Placenta.

Physicians differ as to the proper time for using this method; some commence immediately after the birth of the child, and others later. The most approved way seems to be for the medical man, so soon as the second stage is over, to place his hand over the fundus, and make only sufficient pressure to keep the womb contracted, and then guard against hemorrhage, and at the expiration of about fifteen or twenty minutes, or earlier if a pain commences, make firm pressure downwards and backwards, when the placenta will nearly always be expelled into the vagina, the muscular fibres of which, aided by those of the perineum, will soon effect its final emergence. This pressure should, if possible, be coincident with a uterine pain. It sometimes becomes necessary to repeat the process several times. It may in obstinate cases be supplemented by moderate traction upon the cord.

The membranes generally remain in the vagina after the birth of the placenta. In order to secure their perfect removal it is best to twist them in the form of a rope and extract them very carefully. After the expulsion of the after-birth the physician should be sure that the womb remains well contracted. If it shows any tendency to relax, and thereby permits too great a flow of blood, he must place his hand over the lower part of the abdomen and press the organ with sufficient force to excite proper contraction. When for any reason the baby or anything else demands his attention for awhile, he must show the nurse or the patient how to exercise a proper degree of pressure. Due caution in this respect may prevent dangerous post-partum hemorrhage. All this must be attended to before the application of the binder, as the latter cannot be fully relied upon to cause the proper kind and degree of pressure. In the majority of cases the mere laying of the hand firmly upon the hypogastric region is sufficient to keep the uterus contracted. In others kneading and greater pressure are requisite. Violent or rough measures are detrimental, as they may defeat the object had in view by forcing the plugs of coagulated blood from the sinuses and cause bleeding, or may lead to inflammation of the womb. The treatment for adherent placenta, and retention from hour-glass contraction of the uterus, will be considered elsewhere.

Bandage or Binder.—The utility of a properly applied binder has long been recognized, although it became fashionable among a few physicians some years since to object to its application. There is no doubt that a very narrow and tight bandage is not only useless, but hurtful; but the medical attendant should see that a broad one is snugly, and not very tightly, adjusted around the abdomen, from the ensiform cartilage to the vulva, so that it will rest well on the hips, and not be liable to roll itself, as a narrow one is apt to do, into a mere cord around the waist. A folded napkin is laid by some beneath the binder as a compress to the abdomen. This is, however, unnecessary. A warm soft towel or napkin should, however, be placed over the vulva to receive the discharge. Many practitioners apply the binder immediately after the birth of the child, and before the expulsion of the placenta. As this plan interferes with the proper manipulations for keeping the womb contracted, and for expelling the after-birth, it should not be adopted. A piece of jean, jack-towel, bolster-slip, or strong

cotton-cloth will answer for a binder. It ought not to be "shaped" at first, but may be after a day or two.

The binder ought to be examined and renewed as often as necessary for the purpose of keeping it clean and in position.

FINAL INSPECTION.—The physician must not be in too much haste to leave the house. If everything goes on well he may take his departure in about an hour after the delivery. Before doing so, however, he should examine the napkin to see whether there is much hemorrhage, and the abdomen to ascertain whether the womb is properly contracted. He should then count the pulse, and if he finds it over one hundred per minute, thus indicating danger from hemorrhage, he should remain with his patient until the symptoms are more favorable.

He should leave strict instructions with the nurse as to the management of the patient until his next visit, which ought to be within twelve or twenty hours.

The management of the puerperal state will be discussed in Chapter XXXIX.

CHAPTER XXV.

HEMORRHAGE BEFORE DELIVERY.

HEMORRHAGE, whether before or after delivery, is a subject of the highest practical importance, because of its frequency, suddenness, and great fatality, and the skill, courage, and prompt action required in its management. As a prominent symptom in abortion, we have already had it under discussion, but propose in this chapter to treat of its appearance during the last few months of pregnancy under the old and familiar names of "*unavoidable hemorrhage*" and "*accidental hemorrhage*." In the next chapter, hemorrhage after delivery will come under consideration.

PLACENTA PRÆVIA.—The term "unavoidable hemorrhage" has been so long considered as synonymous with placenta prævia that we feel reluctant to coincide with Matthews Duncan and Playfair in their endeavors to sever the relationship between them, especially as these gentlemen differ from each other in their objections to the term "unavoidable." The latter name was given by Dr. Rigby, about a hundred years ago, to mark the distinction between the hemorrhage that occurs in placenta prævia during the last few months of gestation, and what he called accidental hemorrhage occurring during the same period, when the placenta occupies its normal position in the womb, instead of being planted in the cervical region of the uterus, as it is in the former case. This implantation may be partly or entirely over the internal os uteri. In the former case it is called complete or central, in the latter incomplete, partial, or marginal placenta prævia.

ROEDERER AND RIGBY.—The older writers down to the time of Roederer in the latter part of the eighteenth century, taught that in placenta prævia the placenta originally occupied its normal site in the upper part of the uterus, but becoming by some means detached, and falling down to the cervical zone, implanted itself there, to remain until finally expelled or extracted. So far as known, Roederer, in a work published about 1766, was the first to correct this erroneous idea of the ancients, by teaching that in placenta prævia the placenta occupied its abnormal site from the

commencement. Rigby a few years afterwards was the first to make this view known to the medical fraternity of Great Britain.

Etiology.—Tyler Smith believed that the abnormal situation of the placenta was due to the ovum not being impregnated until it reached the inferior segment of the uterus, but his opinion is not concurred in by the great majority of physicians, who can perceive no difficulty in the ovum after impregnation at the usual site, finding its way down to the cervical zone of the womb, and there becoming attached. Of course it may also sometimes be impregnated where found implanted.

Frequency.—Placenta prævia occurs about once in every 573 cases.

Dr. Simpson's Theory of the Source of Hemorrhage.—The views of Sir James Y. Simpson upon any medical point were always sure of receiving attention. His theory as to the source of hemorrhage in placenta prævia was set forth, with his usual power of reasoning, but failed to gain very general recognition, and is now by the majority of recent writers held as untenable. He believed that the blood flowed from the placental, instead of the uterine orifices of the ruptured vessels at the site of detachment, having found its way thither through the adherent portion of the placenta. As his treatment of extraction of the placenta in unavoidable hemorrhage based in a measure upon this theory is no longer practised to any extent, it would serve no useful purpose to recall the discussion of the theory itself, further than to add that Dr. Mackenzie in some experiments upon bitches was able to demonstrate the fact that the blood flowed from the surface of the uterus at the site of the detachment, and not from the surface of the detached placenta itself.

Causes of the Hemorrhage.—It seems to those physicians who still believe in the old theory of the shortening of the cervix during the last few months of pregnancy, by its gradual expansion from above downwards, so reasonable that the hemorrhage in cervical implantation of the placenta is caused by the gradual separation of the latter from the inferior region of the womb during the expansion, that they are unwilling to admit any other cause. Nevertheless there are some very distinguished modern authorities, among others Matthews Duncan and Playfair, who deny that there is true shortening, or expansion of the cervix from above downwards, except during the last two weeks of pregnancy, and

who consequently oppose the above theory of hemorrhage except so far as it relates to the cervical dilatation just prior to, and at the commencement of parturition. Dr. Robert Barnes has investigated the causes of uterine hemorrhage very carefully, and in order to comprehend his views upon the subject, it is well to state that he makes three divisions of the cavity of the uterus, an upper or fundal, a middle or meridional, and a lower or cervical zone. The latter, which embraces nearly all of the lower third of the cavity of the uterus, he considers the dangerous region of placental attachment, or the only part where the placenta is particularly liable to detachment prior to the commencement of labor. He contends that the hemorrhage in placenta prævia is owing to the excessive relative enlargement of the placenta as compared to the cervical portion or zone of the uterus, and a consequent growing away of the same from the cervix, to which it is not normally adapted, instead of a separation by a greater growth of the cervix than of the placenta during the last three months of gestation, as maintained by Jacquemier and others.

Diagnosis and Symptoms.—In order to make out a proper diagnosis in placenta prævia, it is necessary to consider the symptoms as manifested chiefly by the hemorrhage, together with the results of an examination per vaginam. The placenta, of course, occupies its abnormal site from its primary formation, but prior to the sixth month of gestation there are no characteristic symptoms to enable us to recognize the nature of the case. If hemorrhage should occur at this early period it would be viewed as a symptom of impending abortion, and there is no doubt that this often occurs from an implantation of the placenta over the cervix uteri. But a sudden flow of blood at any period during the last three months of pregnancy without any appreciable cause, such as a fall, blow, stretching of the limbs or fright, is calculated to awaken the experienced observer to the nature of the complaint. The quantity of blood lost may be slight, or it may be enormous. Generally it is not very great when commencing about three months prior to labor, but it is very apt to increase in quantity at each successive hemorrhage until the case is terminated by expulsion of the fœtus, or the death of the mother. In some few instances the placenta is expelled a few hours or longer in advance of the child, when the flooding ceases. It was from a natural hint of this kind that Sir James Y. Simpson and others were led

to the extraction of the placenta in certain cases of placenta prævia, a method of treatment, however, which has never become popular among the profession.

The flow of blood may not occur until labor sets in, and in a few exceedingly rare examples where the labor is rapid, not even then. The frequency of the flowing and quantity of blood lost, are exceedingly variable—the hemorrhage sometimes occurring only two or three times in three months or as many weeks, again repeatedly every day, the quantity varying with the circumstances of the case, being more liable to be excessive when the hemorrhage does not commence until near the end of gestation, because the separation of the placenta from the neck of the womb is more apt to be great under these circumstances than if it had occurred gradually a month or two previously. The flooding sometimes occurs at about what would be the menstrual period if the woman were not pregnant. Occasionally the flooding is so great and so sudden, that death ensues before aid can be summoned, but generally, it only renders the pulse frequent and thready, the skin cold and pale, the respiration short and sighing, the vision dim, and perhaps produces vomiting. In the interval between the floodings the woman rallies, to be again prostrated at the next flooding. When the quantity lost at each time is not great, but the flooding is frequently repeated, the patient becomes exsanguined, emaciated, and exceedingly nervous, restless, and sleepless.

Upon a vaginal examination, the os and cervix uteri will have a doughy feeling to the finger, owing to the unusual thickness of the cervix produced by the presence of large vessels communicating with the placenta, and to the presence of the latter itself. When the presenting head is felt through the inferior portion of the uterus during the latter months of normal pregnancy, there is commonly but little difficulty in recognizing it by its roundness and hardness. When, however, there is implantation of the placenta in this region the diagnosis becomes obscure. This may be the case even when the os uteri is sufficiently dilated for the introduction of the finger, which will strike against a soft, boggy substance, which may be some other presenting part, beside the head, or a clot of blood. The latter can be eliminated in the differential diagnosis by breaking it up under the finger. In partial or incomplete placenta prævia, the point of the examining finger may feel the presenting part through the bag of waters in a por-

tion of the circle of the os uteri, and the margin of the placenta in the remainder of the opening. The edge of the after-birth may be felt on one side of the os in the so-called marginal placenta prævia.

The difficulty in diagnosis of placental implantations in other presentations than the head is often very great, partly because the presentation remains so high in the pelvis, and partly on account of the want of the round, hard skull to press the after-birth against during the examination.

If it be true, as taught for about one hundred years, but now denied by some authorities, that the quantity of blood lost in placenta prævia is increased during a pain, while in accidental hemorrhage it is diminished during a pain, we may even in the difficult cases last mentioned render a correct diagnosis, and in placental implantations in head presentations confirm the results of a vaginal examination.

But this distinction between placenta prævia, or "unavoidable hemorrhage" and "accidental hemorrhage," is considered by Playfair and other eminent authorities as fallacious. They assert that the effect of the pains or contractions of the uterus is to constrict the bloodvessels, and diminish the bleeding in the former, precisely as in the latter condition. They admit that, in many instances of unavoidable hemorrhage, there is an apparent increased loss of blood during a pain, but affirm that it is only the expulsion of blood previously effused, and that the real loss from the circulation takes place during the interval of pains. All parties, however, agree that in placenta prævia the hemorrhage is, in one sense, unavoidable, because the placenta necessarily becomes more or less detached, by reason of its abnormal situation, but cannot, as previously stated, concur as to whether this separation occurs during the last few months of gestation, by the placenta growing too fast for the uterine cervix, or is owing to the latter increasing too fast for the placenta, or to a mere shortening and expansion of the cervix. All agree that during natural labor the contractions of the womb must result in a detachment of the placenta, and an increased hemorrhage; but differ, as just stated, as to whether the actual loss of blood from the vessels occurs during the contraction of the uterus, or in the interval between the pains.

Prognosis.—The prognosis, to both the mother and the child,

is very grave. The mortality in the former case being, if we strike a medium between the estimates of Churchill and Barnes, about sixteen, and in the latter, about fifty per centum.

TREATMENT.—The old method of treating unavoidable hemorrhage consisted mainly in rest, in the horizontal position, on a hard mattress, with light covering, free ventilation, a moderate temperature, cooling drinks, and unstimulating articles of diet, the administration of dilute aromatic sulphuric acid, gallic acid, acetate of lead and opium, and ergot, when an emergency demands it, the use of the tampon, and finally, in very urgent cases, turning by the feet.

The most distinguished modern accoucheurs pursue the above course only in doubtful cases, but recommend more decisive treatment when placenta prævia is clearly diagnosed, especially after the period of viability of the child, when living, or at any time when it is dead, and in all cases of dangerous hemorrhage at any period of pregnancy. Under these circumstances they make no effort at temporizing, in the hope of carrying the woman to the full term of gestation, but use such measures as will most effectually check the flooding, and, at the same time, facilitate the premature delivery of the child by turning. They consider delay, under such urgent conditions, to be fraught with too much peril to the mother to be entertained for a moment, as fatal hemorrhage might take place at any time.

By this energetic management of such cases, the mother stands a much better chance of being saved, than by the old temporizing plan, at the same time the child possesses as good, if not a better, prospect of surviving, than it would if version were not used; for, when premature delivery is not effected, the frequent and abundant flooding would, in all probability, destroy the child. Therefore, when the nature of the case forbids any temporizing, we must adopt some one of the following methods of treatment.

SIMPSON'S METHOD.—The plan recommended by Sir James Y. Simpson, though probably not originating with him, but with Mr. Kinder Wood, of Manchester, was to detach the placenta completely from the uterus, by means of one's finger, and extract it, with the object of thus arresting the hemorrhage.

This method of treatment was suggested by nature herself, in sometimes expelling the placenta, in cases of placenta prævia, into

the vagina, in advance of the head or other presenting part of the child, and thus causing the hemorrhage to stop.

This method has never received the general sanction of the profession. They do not find its performance so easy, or its results so favorable as did Dr. Simpson. In truth, some later authors do not believe it possible to separate the placenta entirely by means of the finger, in cases of partial, or marginal implantation, because it would be necessary for the finger to be at least eight, instead of three inches in length. It is stated that Simpson himself materially changed his opinion as to the usefulness of this method, and finally recommended it only in certain cases, such as the following: When the child is dead; when the child is not viable; in cases of fearful flooding, where dilatation of the os uteri is not sufficient for safe turning of the child; when the child could not be easily or safely turned, because of the smallness of the pelvis, etc.

Barnes's Plan.—Dr. Robert Barnes, as already stated, divided the inner surface of the womb into three zones, the fundal, the meridional, and cervical. He believed that it was only that portion of the placenta which was implanted in the last, or lower zone, that was liable to detachment before labor commenced, and that, not as formerly generally supposed, by the expansion and shortening of the cervix, but by the placenta enlarging faster than the latter, and thus separating itself gradually from it.

He affirmed that a complete separation and extraction of the placenta, according to the Simpson method, was not only generally impossible, but very hazardous and useless, as the checking of the hemorrhage could be brought about much more easily, speedily, safely, and effectually by a partial separation of the placenta, or a detachment of only so much of it as lay in the cervical zone, the only seat of dangerous implantation.

Dr. Barnes's directions are: "Pass one or two fingers as far as they will go through the os uteri, the hand being passed into the vagina, if necessary; feeling the placenta, insinuate the finger between it and the uterine wall; sweep the finger round in a circle, so as to separate the placenta as far as the finger can reach; if you feel the edge of the placenta where the membranes begin, tear open the membranes carefully, especially if these have not been previously ruptured; ascertain, if you can, what is the presentation of the child before withdrawing your hand. Commonly,

some amount of retraction of the cervix takes place after the operation, and often the hemorrhage ceases."

The above operation, however, is only secondary to a puncture of the membranes, which, in Dr. Barnes's opinion, should be tried first, and if it succeeds in checking the hemorrhage, the case is left to the natural efforts; if otherwise, it is supplemented by the partial separation of the placenta, as just described. The primary object aimed at by the puncture of the membranes is an augmented uterine contraction, which, Dr. Barnes believes, will check the hemorrhage in placenta prævia, as well as in accidental hemorrhage. This opinion is coincided in by other late authorities, especially Duncan and Playfair.

Puncture of the membranes is easily effected in marginal and partial implantation of the placenta, but in some cases of central placenta prævia it is by no means an easy or painless operation, because of the necessity of detaching a portion of the placenta, which should be effected on that part of the circle of the inferior zone of the uterus where it has the least attachment. The rupture may be made with a bougie, stilet, quill, hair-pin, or probe, especially Sims's or Simpson's uterine probe, or by the finger-nail.

There are numerous other methods of treatment proposed by accoucheurs, but the foregoing are sufficient for the intelligent practitioner to select from. He would probably never have two cases requiring precisely the same management. In general terms, it may be stated that when he is called to a case before the age of viability of the child, and the hemorrhage is not violent or frequent, he may temporize in the manner described in the beginning of the remarks under treatment. But, after gestation has advanced far enough for the child to have a reasonable chance of living when born, and the diagnosis of placenta prævia is certain, and in all other cases where the flooding is frequent and dangerous in any stage of gestation, it is generally best for both the child and mother that premature labor should be effected as speedily as possible, temporary measures being adopted in the meantime to check the hemorrhage.

Under such circumstances, if we find the hemorrhage very great, and the os uteri sufficiently dilated, and other conditions favorable, we may turn, trying the bipolar method first. If the hemorrhage continues, we may next adopt Barnes's method of partly separating the placenta, or version by the feet. If we conclude

to try the former plan first, after the puncture of the membranes, and fail to check the hemorrhage, turning should be resorted to, without further delay. If the case is favorable for the bipolar method, it should be tried before resorting to the regular plan of podalic version.

It must be borne in mind that turning is not so easily accomplished after, as before, the rupture of the membranes. This is a serious objection to Barnes's routine method of treatment. Neither does the cervix uteri dilate so readily when its natural dilator, the bag of waters, is destroyed. Although in ordinary cases we should not adopt Barnes's method, because of these disadvantages, it might be tried in cases of extreme exhaustion where turning would be likely to end fatally.

Plugging is applicable under all conditions of dangerous flooding, for the purpose of checking the hemorrhage while dilatation is progressing, or when applied to the cervix and vagina, of both stopping the flow and dilating the os uteri. It is one of the principal means upon which the physician can, in many cases, rely. It is applicable in cases when we desire to turn, whether after the artificial rupturing of the membranes, or primarily, where the cervix is not sufficiently dilated to effect our object.

In such an instance we at first, if the cervical canal be very small, insert in it a sponge-tent, or one of Barnes's smaller india-rubber dilators, and subsequently replace it by a larger, the latter to be followed by a still larger until sufficient dilatation has been accomplished. A vaginal tampon should be inserted at the same time, and all secured by a bandage.

Where rapid dilatation is unnecessary a plug in the vagina is all that should be used, as this will control the hemorrhage until natural dilatation of the cervix takes place. The material for the vaginal plugs may be sponge, cotton-wool, muslin, calico, a silk handkerchief, or any similar thing, or an oblong rubber bag like Brown's colpeurynter, filled with air or water. Sponge cannot be retained long on account of becoming very foul. Dossils of cotton-wool wrung out with water and wet with glycerine or carbolized glycerine, with a string attached to each, are probably the best for this purpose. The last inserted should be the first for removal. The tampon may or may not be moistened with a styptic solution of alum, tannin, or the liquor ferri subsulphatis, or the liq. ferri perchloridi properly diluted. The plug can be inserted with or

without the use of the speculum. During the time the tampon is inserted a bandage must be worn around the abdomen, to assist in keeping up contraction of the uterus, or the latter may be compressed by the hands, and some preparation of ergot administered by the mouth or hypodermically if time be urgent.

Dr. Leishman says that "astringents, local and general, have been tried in every possible way in these cases, but it must be confessed that their action is not even in the slightest degree to be depended upon." On the other hand, Professor R. J. Nunn, of Savannah, Ga., in a communication to the American Journal of Obstetrics, January, 1880, claims highly beneficial results from the direct application of the liquor ferri persulphatis (or subsulphatis) "to the bleeding surface by means of a cotton swab passed through the os." He first removes all clots and then inserts a vaginal speculum, through which the swab is directed. This is done before the expulsion of the fœtus or placenta. This method must not be confounded with the application of astringents simply to the vagina, to which the foregoing quotation of Leishman was probably intended to apply.

After the expulsion of the child and placenta the peril from hemorrhage is generally over. Should flooding continue, as it will occasionally, it may become necessary to insert a lump of ice in the womb, or inject into the latter a combination of one part of liquor ferri perchloridi fortior, or liquor ferri subsulph. diluted with six parts of water.

Accidental Hemorrhage.—This term was given by Dr. Rigby, the elder, to that variety of hemorrhage occurring during pregnancy, where the placenta is normally situated, in contradistinction to that called unavoidable, which takes place when the placenta occupies the cervical region of the womb, because he believed that the first always resulted from accident, and the second from contraction of the womb and expansion of the cervix. Although unavoidable hemorrhage or placenta prævia is not a very philosophical designation, and it is denied by some, Matthews Duncan and Playfair among others, that there is any expansion of the superior portion of the cervix until the last two weeks of gestation, or that the actual loss of blood is from uterine contraction; and asserted by Robert Barnes that it arises not from expansion of the cervix, but from a growing away from the latter by the placenta, yet they all admit that it is really unavoidable some-

times during the latter part of pregnancy, and at the beginning of labor; and, therefore, different from accidental hemorrhage, which is really the result of an accident.

Causes.—A blow, a fall, especially a slip down stairs, or upon a slippery pavement; lifting heavy weights, romping and jumping, falls from a horse or vehicle; great fright, as in thunderstorms, extensive conflagrations, robberies, earthquakes; pathological conditions of the decidua or placenta, and many other similar agencies may produce accidental hemorrhage.

Varieties and Prognosis.—There are two principal varieties of accidental hemorrhage. One where the blood, though poured out between the internal surface of the womb and the placenta and membranes, yet finds its way externally; another where the blood, although extravasated as before, fails to find a channel of communication outwardly. The latter is called concealed hemorrhage, and is much more dangerous than the first variety. At least one-half the mothers die and nearly all the children.

Diagnosis and Symptoms.—In the latter variety of hemorrhage the blood may be extravasated between the uterus and the placenta, and either pass or not beyond the margin of the latter, but not externally, giving rise to a general pallor and coldness of the surface, more or less swelling of the abdomen, weak, frequent, and thready pulse, dyspnœa, jactitation, dilated pupils, and occasionally death itself.

The chief conditions from which a differential diagnosis is to be made are syncope and rupture of the uterus. The symptoms are more persistent than in the former, and differ from the latter chiefly in not making their appearance so late in labor, and in not being accompanied by a partial or complete recession of the presenting part from the os uteri. When the blood flows externally there can be no mistake in diagnosis, as its presence is then conjoined with the symptoms above delineated, with sometimes slight modifications, only as it regards a lesser degree of pain and swelling.

Treatment.—This differs but very little from that required in placenta prævia, with the exception that neither Barnes's operation of partial separation, nor Simpson's operation of entire separation and extraction of the placenta is ever required.

Before the fœtus is viable we may temporize with rest, fresh, cool air, horizontal position upon a hard mattress, with moderate covering, quietude, cooling drinks, and unstimulating food, to-

gether with the administration of aromatic sulphuric acid, in some pleasant menstruum like infusion of roses, or syrup of orange-peel or orange flowers, gallic acid dissolved in glycerine, or acetate of lead and opium; but when the symptoms are very severe and dangerous, and especially after the seventh or eighth month of pregnancy, it is better to produce premature labor, or at least adopt such means of stopping the hemorrhage as will lead to this result.

If in a head presentation the accoucheur finds his patient flowing badly and the membranes sufficiently dilated he may turn by the bipolar method, if possible; if not possible, then by the usual plan of bringing down the feet. Or he may first rupture the membranes, and apply an abdominal bandage. If the hemorrhage ceases he may leave the case to nature; but if it continues, he should then turn—trying the bipolar method first. Whether he first tries turning, or puncturing the membranes and turning, if necessary, subsequently the os uteri must be artificially dilated, if not already sufficiently open. For this purpose sponge-tents and Barnes's rubber dilators are admirably adapted; because they meet two indications at the same time, suppression of hemorrhage and dilatation. While *in situ* they should be supported by a vaginal tampon of cotton, sponge, muslin, or Braun's colpeurynter, surrounded or not with spongio-piline, or by some similar plug. A bandage should be around the abdomen to keep up uterine contraction and prevent internal hemorrhage; also one over the vulva to retain the tampons. Ergot may also be found useful. The usual directions should be followed of moistening the tampons in disinfectants, or styptics if necessary, and renewing them frequently. After the expulsion of the fœtus and after-birth, the hemorrhage almost universally ceases. Should it not do so, the treatment will be similar to what is requisite in other cases of hemorrhage after delivery. So will the after-management to restore the strength of the patient be the same as under similar conditions arising in the latter form of hemorrhage. In all forms of hemorrhage before and after labor, where syncope, collapse, or shock results from the flowing, diffusible stimulants by the mouth, or hypodermically are applicable—such as brandy, whiskey, ether, Hoffman's anodyne, or aromatic spirits of ammonia. The latter remedy I have never seen administered hypodermically, but suppose that it may be thus used if properly diluted.

CHAPTER XXVI.

HEMORRHAGE AFTER DELIVERY.

POST-PARTUM hemorrhage, strictly speaking, can only occur after the third or last stage of labor; but we shall include under this head, hemorrhage taking place at any time within a few hours after the birth of the child, whether before or subsequent to the expulsion of the placenta. There is hardly any emergency in the practice of midwifery so alarming, or so dangerous, as hemorrhage. In some cases the blood pours forth in such torrents as to strike dismay into the stoutest hearts, and carry off the patient before the doctor has time to arrange his plan of treatment. There is no time to look up authorities. Prompt action is absolutely necessary. The student or young physician should bear this in mind, and remember that although such cases are not very common, his very first midwifery patient may afford him an example. This was my experience while yet a student of medicine. The woman in this instance gave birth to a child in the temporary absence of her attending physician. There being an "hour-glass contraction" of the uterus with retained placenta, the hemorrhage was perfectly appalling. Being hastily summoned to the case, I succeeded in removing the afterbirth and checking the hemorrhage before her physician arrived. The difficulties of my position were rendered embarrassing by the noise and confusion created by the patient's Irish friends, who crowded the room, weeping and wailing most frantically, because they were fearful that she would die before the arrival of a father-confessor.

At the conclusion of one of my lectures upon the subject of "hemorrhage after delivery," before a medical class, I asked a candidate for graduation what treatment he would adopt in such a case. Although he was a clergyman, and had apparently paid strict attention to my lecture, he replied that he did not know, but thought bleeding from the arm would do. Notwithstanding this man was unable to answer any better many of the essential questions in other branches of medicine, and failed to pass in single chair, he considered himself a martyr. If there were many

more such martyrs made by our medical schools, there would be fewer valuable lives sacrificed on the altar of inexcusable ignorance. The student should remember, that it is not every flow of blood after the expulsion of the fœtus, that constitutes a hemorrhage, for there is more or less of a sanguineous discharge after every labor. Neither should he be misled by the gush of retained liquor amnii upon the expulsion of the head, as the latter often acts as a ball-valve and prevents a large proportion of this fluid from escaping, even when the membranes are ruptured, until the birth of the head, when it may be colored with a mixture of more or less blood. An examination of the fluid will enable him to make out the nature of the case.

Frequency and Mortality of Hemorrhage in Childbirth.—When I hear of the great frequency of post-partum hemorrhage in the practice of any particular physician, I charitably conclude that he has mistaken sanguinolent liquor amnii for a flowing of blood, or has failed to use the preventive treatment, especially abdominal pressure, after the birth of the child. For hemorrhage cannot be considered a very frequent accident of delivery; yet it is really more so than most of the other complications of labor. The frequency of hemorrhage in childbirth, before and after labor, is stated by Churchill to be one in every one hundred and twenty-two cases; mortality to the mother, one in six; to children, one in three.

Causes of Post-partum Hemorrhage.—There is a constitutional predisposition in a few women to "*flooding*" after delivery, probably from a so-called hemorrhagic diathesis. Some of them are troubled with it after every confinement, and cause much anxiety to their physician. Still the number of these cases, as well as of those where there is no constitutional predisposition, would doubtless be much less if proper preventive measures were adopted after every labor. But even when the accoucheur exercises ordinary caution as a matter of routine he will occasionally meet with a case of hemorrhage. Perhaps one of the most frequent causes is uterine inertia, which in its turn may arise from excessive and long-continued action of the uterus, or from overdistension as in the case of triplets, and excessive quantity of liquor amnii, or from the inhalation of too much ether or chloroform.

Inertia, and consequently hemorrhage, may, however, arise from anything that has a tendency to reduce the vital energies of the

constitution—such as frequent abortions, or rapidly succeeding pregnancies, wasting diseases, especially Bright's disease in its advanced stage. Any one of the following conditions may cause hemorrhage: A retention of the placenta either from adhesion or irregular contraction of the uterus—such as "hour-glass contraction," or "encysted placenta;" or retention of a portion of the placenta; or of the small placenta, in a case of placenta succenturia; or a piece of the membranes, or a clot after the expulsion of the afterbirth; the presence of a polypus, fibro-polypus, or fibroid tumor. In short, any condition of the uterus preventing firm contraction immediately after labor, while the uterine sinuses are still open, may give rise to hemorrhage. A firm, regular, and continued contraction of the uterus after the expulsion of the fœtus is incompatible with hemorrhage, and the opposite condition of relaxation is highly favorable to it, yet if the uterus contracts long enough for thrombi to form in its sinuses, hemorrhage may not take place, even though it remains relaxed and flabby for awhile subsequently. I have known the presence of a large clot in the cavity of the uterus to give rise to intense pains and fearful hemorrhage. A too hasty extraction of the child by instruments, or a too rapid emptying of the uterus in precipitate labors, will sometimes produce hemorrhage.

Inversion of the uterus is another cause of hemorrhage, and might be mistaken for a polypoid or other tumor.

"Adhesion of the Placenta" and "Hour-glass Contraction."—These conditions which I have enumerated among the causes of hemorrhage are by no means so frequent as is generally believed. There is no doubt but a mere retention of the placenta from inertia, or a normal attachment, has been mistaken for adhesion, which properly means a growing fast of the placenta to the inner surface of the womb as a result of some antecedent pathological condition of the mucous membrane of this organ, and subsequently of the decidua.

A partial is more common than a complete adherence, and is more productive of hemorrhage, especially when the remainder of the placenta is detached. In what is called an "hour-glass contraction" of the uterus this organ is constricted near its centre, according to Hodge; or at the internal os uteri, according to Playfair; and relaxed above and below this point, the placenta remaining encysted in the upper portion of the uterine cavity. The

placenta may, however, become encysted in any part of the cavity of the uterus. These irregular contractions are apt to produce very serious hemorrhages.

Symptoms of Flooding.—The most prominent symptom in most cases is the loss of blood, which frequently comes away in torrents.

Perhaps just as the doctor is receiving the thanks of his patient for the supposed termination of her troubles in the birth of a living child, and while she is overjoyed at the congratulations of her happy husband, a death-like pallor comes suddenly over her late animated countenance, and if able to articulate she may say in a low whispering tone that her sight is dim, or worse still, that she is blind; she gasps for breath, has a feeble, frequent, and thready pulse, or none at all, or in rare instances a peculiar bounding, "hemorrhage pulse," her skin grows cold and becomes covered with a profuse perspiration, jactitation and vomiting may next appear, and sometimes the patient faints, or even passes into a condition of fatal syncope. If death ensues it is sometimes preceded by convulsions. Of course, while these constitutional symptoms are manifesting themselves hemorrhage is going on either externally or internally, or both. The blood may cover the bed and run in great streams over the floor; or it may for awhile be prevented by some irregular contraction of the uterus and the formation of clots from flowing out, but remain in its cavity, causing very great distension, and pain, if the patient be not insensible.

Of course, the above description is only applicable to the severest cases. In milder ones, whether the hemorrhage be external or only internal, the woman may become very pale and faintish, and unable to see well; may be sick at the stomach and may probably vomit; her skin may become cold and covered with a clammy perspiration; the pulse feeble, frequent, and almost imperceptible. If the hemorrhage be promptly checked the more serious symptoms, as first described, may not make their appearance. Yet the quantity of blood lost is by no means a sure criterion of the gravity of the constitutional symptoms, for women are afflicted differently by the same quantity of blood lost from the circulation, whether internally or externally. What will only produce a faintness in one, may result in fatal syncope in another.

The old adage that "as long as there is life there is hope," should be borne in mind while treating a case of post-partum hemorrhage. For the patient may rally under judicious treat-

ment when death seems almost inevitable. If she recovers, convalescence is apt to be very slow. It occasionally takes weeks, months, or even years for the constitution to rally from the shock.

In cases of slight hemorrhage, or where though tolerably severe it is readily and quickly controlled, no serious results follow.

The hemorrhage may commence immediately after the birth of the child, or not until after the expulsion of the afterbirth, and may be slight or very great. When it takes place, the womb generally becomes more or less relaxed, and loses that hard globular outline that the accoucheur loves so well to feel.

TREATMENT—PRESSURE AND ERGOT.—If hemorrhage occurs prior to the termination of the third stage of labor, the placenta must be expelled from the womb aided by abdominal pressure, or failing in this, the hand must be gently passed into the cavity of the uterus in the intermission or remission of pain, the placenta seized and gradually removed during a pain. This plan is applicable whether the placenta is simply undetached, detached, adherent, or encysted, with slight modifications for each particular condition.

The patient can be treated most conveniently lying upon her back with her head low if the hemorrhage be great, to guard against faintness or syncope. The practitioner should seize the fundus of the womb in the hollow of his left hand and make pressure in the direction of the parturient canal, now and then gently kneading the part if necessary. At the same time he should inject hypodermically a solution of ergotine, or sufficient fluid extract of ergot.

EXTRACTION OF AFTERBIRTH.—If, however, speedy expulsion of the afterbirth be not produced, he should lose no time in its extraction as just stated. If it be lying loose in the cavity of the womb, as is apt to be the case in simple inertia of this organ, its removal is generally very easily accomplished.

WHEN ADHERENT.—If, on the contrary, it is adherent, we must peel it off from the womb in as gentle and thorough a manner as possible. Commonly this can only be effected by piece-meal as it were, and if any degree of roughness or unskilfulness be exercised, the womb may be injured, as its tissues are sometimes in a somewhat unhealthy condition.

WHEN ENCYSTED.—When we have hour-glass contraction to contend with it may be difficult to pass the hand through the

constriction, but by first inserting a finger or two, or all the fingers in the form of a cone, and making gradual, continuous pressure, the stricture will finally yield, so that the whole hand, or enough of it for the object in view can be inserted and the afterbirth extracted. In any of the minor forms of irregular contraction of the womb where the placenta is encysted it may be necessary to only pass the fingers through the constricted portion of the uterus in order to remove the placenta. In all cases where it becomes necessary to insert one hand into the uterus for the removal of the placenta, the uterus must be supported by the other placed over the abdomen.

If the hemorrhage continue after the extraction of the afterbirth, or commence then for the first time, we must resort to abdominal pressure and the hypodermic injection of the fluid extract of ergot, or a solution of ergotine.

Cold Water and Ice.—If the hemorrhage still remains unchecked, cloths wrung out in cold water should be applied suddenly and intermittently to the hypogastric region and vulva in order to cause contraction of the uterus by reflex action. If applied continuously this object is not gained. Dr. Tyler Smith asserts that the reflex contraction is secured more certainly by using cold and warmth alternately, whether the application be made externally or internally. Iced water may be injected into the rectum, vagina, or uterus itself, or a lump of ice inserted in either of these places. It must be remembered, however, that cold is a powerfully depressing agent if used too continuously or too long.

Hot Water Injections.—Much has lately been written about hot water injections into the cavity of the uterus. Playfair has tried this method and says that the temperature of the water should be from 110° to 120° Fahrenheit. This appears to be the warmth usually tried, but Dr. L. Atthill, who in 1878 first brought under general notice (although not the first to use it) the injection of warm water into the uterus for hemorrhage, stated in a discussion upon this subject at a meeting of the British Medical Association, in 1879, that a temperature of 120° is too hot, and that 100° is the proper warmth. He further stated that the use of *hot or warm water* ought not to supersede *cold water*, which he considers the *most efficient* of *all agents* (ergot and perchloride of iron not excepted), "if used in proper cases and at the right time,

that is, while the patient was warm, and reaction consequently followed. If its use were prolonged, or the patient were cold and exhausted, it was worse than useless. It was at this stage that hot water came in with advantage."

Dr. Atthill states, in substance, that hot water at proper temperature causes contraction of the uterine muscular tissue, and may in suitable cases sometimes render the use of the perchloride of iron unnecessary, but that the latter remedy was in some cases absolutely demanded in preference to hot water or any other agent whatever, but that it was not always a safe remedy.

Dr. William Walter, of Manchester, who took part in the debate, had tried hot water in eleven cases, at a temperature ranging from 110° to 120° Fahrenheit, and had come to the conclusion that it was, as a means of producing uterine contraction, an unreliable agent. It would seem that further experiments are necessary in the use of hot or warm water before it can be claimed as a valuable agent in post-partum hemorrhage. Plugging the vagina, although highly useful before labor, and recommended by some physicians after parturition, is condemned by the great majority of the profession.

Pressure of the Abdominal Aorta.—Pressure of the aorta is an old measure revived in the time of Baudelocque and recommended by this distinguished author. It is still considered as a valuable temporary means of arresting post-partum hemorrhage, while more efficient and permanent remedies are being brought into requisition. Among the various methods of pressure recommended, such as through the walls of the abdomen and uterus, etc., the best is to press the abdominal aorta just above the fundus uteri by the four fingers. The compression may be continued from two to four hours if necessary. M. Jacquemier opposes the practice because in his opinion the blood which escapes comes "in great part from the veins, and compression of the aorta could only favor the reflux of venous blood into the vena cava and the branches which empty into it." Other authorities state that it is almost impossible to compress the abdominal aorta without also compressing the inferior vena cava, and that it is really more useful to compress both than the aorta alone, for then no reflex of blood can take place into or through the vena cava. Cazeaux is of this opinion. Another objection is, that although the compression of the abdominal aorta may cut off the supply through

he uterine arteries, it increases the quantity passing through the varian arteries, if the operation is applied below the origin of he latter. If the hemorrhage be chiefly venous this objection is f but little value.

Dr. Griffith, in a communication to the Obstetrical Journal of Great Britain and Ireland, claims that he saved the life of a patient n post-partum hemorrhage by encircling the aorta with his ingers, and arresting the hemorrhage. Similar success has been ccredited to other practitioners. As the operation is easy of performance, and seems to have been practised successfully, there s no reason why it may not be tried at least as a temporary expe- lient while other methods of treatment are being arranged, or even in conjunction therewith.

Styptics.—Among this class of remedies the liquor ferri per- chloridi has been most extensively used as an injection into the avity of the uterus, diluted in the proportion of one part to six f water. Barnes says four ounces to twelve ounces of water. nstead of injecting it, a few late writers believe that it is more eneficially and safely applied by means of a saturated sponge arried directly to the bleeding surface. Owing to the advocacy f this agent by Dr. Barnes it has recently attracted much atten- ion both in Great Britain and the United States. Its use was ecommended both by D'Outrepont and Kiwisch many years ago. he majority of practitioners look upon the action of this agent vith great apprehension, and some utterly condemn its use.

Many of the best accoucheurs, however, acting upon the prin- iple that it is justifiable to overcome a certain pressing and great vil by a less one, do not hesitate to employ it when all other means ave been tried in vain. It is particularly adapted to those cases f incontractility where the uterus is loose and flabby. As a pre- iminary it is best to remove all clots from the womb. The action f this styptic is threefold. It coagulates the blood in the mouths f the uterine vessels; it constringes the mouths of these vessels themselves; and frequently stimulates the muscular fibres of the uterus into contractility—thus causing the hemorrhage to cease. But the danger in its use must not be ignored. The coagulation f the blood may extend further than the mouths of the uterine vessels, and coagula might be carried to the centre of the circula- tion and produce death, as has really occurred; and that too in a simpler use of this agent than the application to the open sinuses

of the cavity of the womb—such, for instance, as the injection of a few minims into a nævus on the face.

Another source of danger is the possibility of a portion of this substance finding its way through the Fallopian tubes into the peritoneal cavity and producing peritonitis.

In the United States a solution of the subsulphate of iron, either diluted or not, has been used by many practitioners as a substitute for the perchloride of iron, because it is thought to be quite as efficacious and perhaps not so dangerous.

STIMULANTS, ETC.—In our efforts to stop the hemorrhage by local treatment we should not overlook the general condition of the patient. In order to overcome the tendency to syncope we must administer stimulants, such as brandy, or whiskey, or ether, or compound spirits of ether, or aromatic spirits of ammonia, properly diluted, either by the mouth, rectum, or hypodermically, according to the circumstances surrounding each case. The enormous quantities of brandy or whiskey given by some physicians are unnecessary and frequently harmful—such, for instance, as a pint, or even a quart, to a woman, who perhaps had never taken a tablespoonful in her life. Fortunately for the patient, her condition is frequently such that but a very small quantity of the fluid can be absorbed, or poisoning by alcohol would become more dangerous than the loss of blood.

REACTION AND CONVALESCENCE.—If death does not ensue during the collapse that follows the flooding, very distressing nervous symptoms not unfrequently show themselves, such as great intolerance of sound and light, nervous prostration, and severe headache. These symptoms are best combated by the administration of some one of the numerous preparations of opium, such as laudanum, McMunn's elixir, or one of the salts of morphia. Chlorodyne is occasionally of service.

During the convalescence it is highly necessary to encourage the patient to partake freely of beef essence, egg beat up in milk, milk itself, sometimes egg-nog or milk-punch, though the first named articles are usually sufficient. She must be kept quiet, in a well-ventilated apartment. If she remain pale, feeble, and anæmic for a long period some of the numerous preparations of iron, or iron and Peruvian bark, alone or in combination with the extract of malt, or maltine, will be found highly useful.

TRANSFUSION.—In those almost desperate cases of hemorrhage,

both before and after childbirth, where, notwithstanding the hemorrhage has been checked, life seems to hang as it were upon a thread, it may be worth while to try the effects of what is known as transfusion. So far as it relates to the intra-venous injection of blood obtained from the lower animals it is an ancient operation, and was formerly practised to meet various therapeutical indications, but it has recently been performed chiefly in desperate cases of hemorrhage, especially uterine.

Transfusion had fallen almost into total neglect when Dr. Blundell, in 1824, called the attention of the profession to several successful operations with human blood, which he considered the only kind that ought to be used, and maintained that blood from the lower animals could not be used successfully. Although Dr. Blundell's article upon the subject caused transfusion to be considered a legitimate operation, it has never become very popular. His statement as to the unfitness of any other than human blood for the human patient has produced much controversy; some authorities denying the proposition altogether, and others taking a medium view, and asserting that the blood of such of the inferior animals, like the sheep, as have blood corpuscles smaller than those of man could be used safely and beneficially. Dr. Blundell's assertion has been sustained by a report from the "Transfusion Committee" to the Obstetric Society of London, December 3d, 1879. The committee concluded "that the only useful fluid to use for transfusion after hemorrhage was blood of an animal of the same species, or at least the same genus, and that, therefore, human blood alone should be used for man." This conclusion has a double bearing, first as to the character of the blood; and, secondly, in opposition to the use of any other fluid for transfusion, such as milk, etc., which were experimented upon. Allusion will again be made to milk after we have given a short description of the manner in which blood is tranfused.

Method of Operating.—There are two principal methods of introducing blood into the circulation of the patient. By one it is carried directly from the vein or artery of the person supplying it into that of the patient by means of a connecting tube; by the other it is first drawn from the donor and defibrinated before its injection into the patient. The former method is termed "immediate transfusion" and the latter "mediate transfusion." Arterial transfusion should never be performed except by a skilful surgeon.

There are several ways of performing immediate transfusion, but space will only suffice for a brief description of the most common methods,—those of Drs. Aveling and Shäfer. The instrument used by the former is represented in Fig. 100. The plan usually adopted is to fill it with tepid water, so as to exclude the air, then to open the basilic vein of the person furnishing the blood and of the patient, then to insert the silver canula of one end of the instrument into the former, and that of the other end into the latter. Next pinch the rubber tube between the donor and bulb, squeeze the latter so as to force the water into the vein of the patient. Then pinch the tube between the patient and bulb, and let the latter expand so as to form a vacuum, which is immediately filled with the donor's blood. Now change the compression again to the tube between the donor and bulb, and squeeze the latter as at

FIG. 100.

first, when blood will be forced into the vein of the patient. The process may be repeated so long as necessary. The quantity of blood thus forced into the circulation of the patient must depend upon the effect it has upon the latter. If it embarrass the respiration very much it must be suspended for awhile, and renewed again or stopped, according to the circumstances of the case. The average quantity used is about six ounces. The quantity used can be ascertained by multiplying the capacity of the bulb by the number of its compressions. A stop-cock near each end of the instrument would be a useful substitute for compression by the fingers, as each could be alternately opened and shut as required. The blood must be supplied by a healthy person.

SCHÄFER'S METHOD.—Dr. E. A. Schäfer, in his committee report to the Obstetric Society of London,—to which allusion has been made,—says in substance that "the use of an elastic pump, as Aveling's apparatus, could not accelerate the flow from a vein a

might do the contrary, since suction would only cause the walls of the vessel to collapse, and might suck them into the orifice of the tube." He deprecated the use of any pump, since it was likely to form clots. He thought the apparatus should have the least possible internal surface,—the best being a short flexible tube with a glass canula at each end,—the glass being preferred to metal because air-bubbles could be detected through it.

"The following was the procedure to be followed for venous transfusions: the tube should not be less than ¼ inch in bore, and 7 inches long. It should first be placed in a solution of carbonate of soda in hot water. In the case of the receiver, a fillet should be tied around the arm above and below the vein, the vein should be exposed, a short piece of it cleared from surrounding tissue, and a pointed piece of white card slipped underneath it. A piece of the donor's vein should then be cleared in the same way, a ligature passed underneath it with an aneurism-needle, the vein opened with pointed scissors, and the canula tied into it. The delivery canula should then be slipped into the receiver's vein as soon as the blood begins to flow from it. Another plan was to fill the tube first with the solution of carbonate of soda. Both canulæ might then be inserted before the blood was allowed to flow. After the transfusion, bleeding from the veins was to be stopped by pressure in the usual way.

"For arterial transfusion the following was the plan to be adopted: the dorsal artery of the foot should be chosen, in this a high pressure might be obtained if the person stood upright. If the person were fat, the radial artery might be used. The tube must be firmly secured to the canulæ on account of the considerable pressure of the blood. The apparatus was first to be placed in solution of carbonate of soda as before. An incision 1¼ inch long was then to be made over the artery. A piece of artery, ⅜ inch long, was to be separated by an aneurism-needle, and a pointed piece of card slipped underneath. Before the vessel was divided, a ligature was to be placed tightly round the lower end and loosely round the upper, the upper end being secured for the time by a spring clip. Then the canula was to be tied into the artery. Both receiver's and donor's arteries were to be prepared in precisely the same way. By removing the spring clip, the blood was to be allowed to flow for about one minute. Finally, the upper ligatures were to be tightened, and the separated pieces

of artery into which the canulæ had been tied, cut out and removed."

THE MEDIATE PROCESS, OR INJECTION OF DEFIBRINATED BLOOD.—In order to obviate the danger of coagulation of the blood attendant upon Aveling's operation just described, various methods have been devised to deprive this fluid of its fibrine previous to its injection into the vein of the patient. The plan usually adopted is to stir it briskly with a clean silver fork or a glass rod as it flows into an open vessel from the donor until the fibrine coagulates. The blood should then be filtered through a piece of fine muslin, previously moistened in hot water, into a bowl kept a little above blood heat by being placed in a basin of warm water. It may be injected into the patient's vein by any small syringe having a sharp-pointed nozzle, though an instrument like Aveling's, with the addition of valves, would be preferable. The instrument or syringe should be filled with the warm defibrinated blood so as to force out the air before its point is introduced into the vein of the patient. In order to open a vein McDonnell recommends it to be laid bare by pinching up a fold of the skin, which should be transfixed with a temporary knife or small scalpel, when the vein lying at the bottom of the wound should be slightly elevated with a probe before being opened with a lancet in order to insert the point of the instrument. Whether the blood be introduced by this or any other methods it must be from a strong, healthy person. If the transfusion of blood has a beneficial effect upon the patient, but is not sufficient with the help of stimulants to prevent a return of syncope, the operation might be repeated. When practicable it is better to do so before this condition is fully established.

TRANSFUSION OF MILK.—Milk has recently been substituted for blood for intra-venous injection, and has been found to be a useful and handy substitute by several distinguished American physicians, especially Dr. Thomas, of New York. On the other hand equally eminent practitioners are opposed to the innovation, or at least think that its efficacy has not been fully established. Dr. W. S. Playfair, in his annual address as President of the Obstetric Society, of London, February 4th, 1880, used the following strong language against its employment. In discussing the "Report on Transfusion," presented by Dr. Schäfer at a previous meeting, he says: "The first important result of this investigation

that it disposes, once and for all, on indisputable grounds, of the use of milk, beef-tea, and other fluids instead of blood. Within the last year or two, Dr. Thomas, of New York, and others in America, have published cases in which transfusion has been performed with such agents, of which the most that can be said is that some of the patients survived in spite of the operation. Dr. Schäfer's researches into the action of such fluids on the blood-corpuscles will, I cannot but think, insure our not hearing more of such experiments. The operation is one in which I have myself always taken great interest, and, after a careful study of all that had been written on the subject, I had come to the conclusion that the use of defibrinated blood, with a simple syringe, best fulfilled the indications which seemed to me essential for success, viz., simplicity of apparatus and ease of performance, and this was the method I had adopted in several cases in which I had performed it after severe post-partum hemorrhage. Dr. Aveling's method of immediate transfusion I had not tried, theoretically good as it was, because the manipulations required seemed to me too complex for general use. Curiously enough, the use of defibrinated blood, so strongly recommended by many, is the one method which Dr. Schäfer seems not to have adequately discussed in his report. Whatever his reason for this, I think we must admit that he has so simplified the method of immediate transfusion from vein to vein, that every one who resorts to the operation for the future will prefer to try it. The apparatus costs next to nothing, it may always be carried in a corner of the obstetric bag ready for use on any unforeseen emergency arising, a point of no little importance, and the necessary operative procedures are so simple that no one need shrink from resorting to them. The same can hardly be said of the proposed method of transfusing from artery to artery, in which I confess I see much practical difficulty. I think you will agree with me that the society has good cause to congratulate itself on its action in directing investigation to this important topic."

Method of Transfusion of Milk.—The milk should be fresh, free from acidity, and have when injected a temperature of about 99° Fahrenheit. It may be taken from the cow or goat, but that from the ass or mare might answer. The average quantity required for an adult is about half a pint. It should be drawn fresh from the animal into a fine wire gauze strainer and be allowed to

run through into a bowl kept at the proper temperature by a warm water bath. The medium of introduction may be a glass funnel, having attached to it an india-rubber tube with a nozzle, or perforating canula with a stop-cock to regulate the flow of milk. In order to prevent the entrance of air into the vein the milk should be permitted to run through or fill the tube, when by closing the stop-cock air is not only excluded from the tube, but, by capillary attraction, from the canula. The vein should now be perforated by the sharp point of the canula, the cock opened and the funnel sufficiently elevated to allow the milk by its own weight to enter the vein.

Secondary Hemorrhage.—This is defined by McClintock as a "hemorrhage commencing after a patient has been six hours delivered, and within a month of this time." As a rule, if a patient is not troubled with hemorrhage within a few hours after delivery she is considered safe from this accident. Yet there are instances of flooding occurring subsequently. It may be produced by constitutional vice, disease, or diathesis, or by some local trouble, such as retroflexion or inversion of the uterus, fibroid tumors or polypus of the uterus, hæmatocele of the cervix or vulva, or a laceration of the cervix, but by far the most usual causes are the *retention of small portions of the placenta or membranes*, or *clots* in the cavity of the uterus, or an *irregular and imperfect contraction of the uterus*.

Treatment.—When hemorrhage arises from the last-mentioned causes, the blood may flow externally, or it may collect in an enormous mass, so as to fill and distend the cavity of the womb very greatly; producing pain of a rhythmical character, more intolerable than that of labor itself. If, under these circumstances, the uterus cannot be made to discharge its contents by abdominal pressure, no time should be lost in passing the hand into the uterine cavity and breaking up and removing the clotted blood, as well as all remnants of retained afterbirth.

The enormous coagula usually form, if at all, within the first day or so after delivery. When hemorrhage takes place at a later period, the blood commonly flows externally. In some of these cases coming on two or three weeks after confinement, the cervix uteri has to be dilated with sponge-tents, tupelo-dilators, or sea-tangle, tents (laminaria), Molesworth's dilators, Hunter's dilators or Barnes's bags, prior to the removal of the retained pieces

afterbirth or coagula. If rapid or great distension becomes necessary, an anæsthetic ought to be used during the operation. As a rule, the hemorrhage, although ceasing at intervals, will continue to return until the offending foreign substance in the uterus is got rid of, either by expulsion, extraction, or the slower and more dangerous process of decomposition and disintegration. The last-mentioned process is dangerous in many ways, but chiefly in keeping up a continual drain upon the system, by hemorrhage, and of occasionally terminating in septicæmia. After the removal of all irritating matter from the womb, or previously, when these substances cannot be got rid of, it is good practice to use intra-uterine disinfecting injections, in a judicious manner, being careful to allow the fluid thrown into the womb to run out again quite easily, so as to avoid the danger of its passing along the Fallopian tubes into the cavity of the peritoneum, and thus producing peritonitis. Molesworth's intra-uterine syringe may be found useful for intra-uterine injections.

CHAPTER XXVII.

TEDIOUS, OR PROLONGED AND PRECIPITATE LABORS.

INERTIA OF THE UTERUS AND ACCESSORY MUSCLES.—Under the head of tedious or prolonged labor, might be included all cases of parturition where the expulsion of the child is abnormally delayed, whether arising from deficient action of the expulsive powers of the uterus or accessory muscles, or both combined, or from obstructions to labor of any nature whatsoever; but, having followed the custom of considering obstructions under a separate head, I have only to treat of prolonged labor resulting from inertia of the uterus, and other parturient powers.

The average duration of labor, ascertained from a very large number of cases, may be put down at from eight to ten hours, being, as a rule, longer in primiparæ than in pluriparæ. It has been the custom among many obstetricians to define tedious or prolonged labor more by reference to its duration than its effects upon the mother, labor under twenty-four hours' duration being considered as normal, but if exceeding that period, as abnormal and tedious. The more advanced authorities of our time, do not consider the actual duration of labor as a sole basis of distinction between a normal and tedious parturition, but look rather to the symptoms and their causes; as they recognize the fact that the symptoms of tedious labor show themselves much earlier in some patients than others. In a case, for example, where the presenting head or pelvis remains above the brim, and the bag of waters unbroken, a woman may be in labor a day or more without experiencing as dangerous symptoms as another in labor only twelve hours, with the presenting part in the cavity of the pelvis, and membranes long ruptured. This difference of opinion, as will be shown hereafter, has a very important practical bearing upon the treatment of such cases.

Inertia of the uterus may exist at the commencement, and continue during the whole period of labor; or it may come on, more or less suddenly, at any stage of this process.

CAUSES.—Inertia may be the result of excessive or prolonged

action of the uterus, in any of the forms of obstruction to labor enumerated in another chapter, but we shall consider, at present, causes of a somewhat different nature.

General Debility.—It may arise from general debility in a woman whose health has been impaired by chronic disease, or it may be owing to her constitution being naturally feeble. In both of these examples nature is very apt to compensate for feebleness in propulsive power, by relaxation in the parturient passages, thus rendering less power necessary to produce expulsion of the child. Take, for instance, a woman in the last stage of consumption, who may be too feeble to walk, and yet have sufficient uterine power to give birth to a child with comparative ease, because the resisting tissues of the parturient canal have become relaxed and enfeebled in proportion to those exercised in propulsion.

Warm Climate and High Temperatures.—A long residence in a hot climate is said to create a predisposition to, and sometimes actual, inertia. The relaxing effect upon the muscular and nervous tissues produced by a long-continued high temperature, is quite noticeable during the summer months of even the temperate zone.

Frequent Childbearing.—Frequent childbearing is thought to have an enfeebling effect upon the uterus, especially towards the end of the childbearing period.

Mental Impressions.—Anything that may give rise to sudden deep emotion or alarm, may temporarily depress or stop the action of the uterus and accessory muscles, but this rarely results in permanent harm, unless occurring at some critical period during labor, as, for instance, in a breech presentation after the expulsion of the body of the child, and before the delivery of the after-coming head, when a few minutes' delay may result fatally to the child, from prolonged pressure upon the umbilical cord. As will be seen under the head of the treatment of pelvic presentations, the medical attendant must be prepared for such emergencies by having his forceps always at ready command.

Abnormal Conditions of the Abdominal and Thoracic Viscera and Muscles.—An overdistended bladder may render the action of the accessory muscles powerless, because of the intense pain their compression upon this organ would produce. Inflammation of any of the abdominal viscera would have the same effect; so, too, would inflammation of the lungs, pleura, thoracic or abdominal muscles. Even a loaded rectum, besides being in

many cases a real obstruction, and thereby having a tendency to produce secondary inertia, from excessive action of the womb to overcome it, may render primary inertia more marked. At least some authors draw this inference from the well-known fact that emptying the rectum by an enema often has the effect of rendering uterine contractions stronger and more effective.

Age of the Patient.—The two extremes of the childbearing epoch are presumed by many observers to predispose to uterine inertia. An imperfect development of the uterine muscular tissue by giving rise to irregular contraction, is the source of trouble in the very young woman; but it is not so evident why the mature female, at the other end of the period, should also have a special tendency to inertia.

Dropsy of the Amnion, and Excessive Quantity of Liquor Amnii.—It is easy to understand how both these conditions, by overdistending the walls of the uterus, can render the action of this organ feeble and inefficient.

Symptoms.—As the symptoms of prolonged labor are modified by any of its numerous causes, it would be difficult to attempt a full description of the same, under a single head; but, to avoid needless repetition, it may be well to call attention, at present, in a general way, to those belonging to *inertia* from whatever source arising, as well as those from protracted labor, whether inertia intervenes or not. The most prominent characteristic of simple inertia, not arising from overexertion, are the *diminution* or *suspension of contractions* of the *uterus*, or of this organ and its *accessory muscles*. These phenomena may manifest themselves at any stage of labor. If present during the first stage, the whole process of parturition goes on slowly. The pains may be so feeble and inconstant for awhile, as to leave both the patient and her medical attendant in doubt as to whether labor has really set in or not. The os uteri may be found, upon an examination by the finger, very open and relaxed, sometimes almost fully dilated, yet but very little effected during a pain, its edges not becoming thin and tense at this time as would be the case during a good, normal or regular pain. Neither do the membranes become as tense or bulge out so much as they should do when labor is progressing properly. With the exception of nervous anxiety and loss of sleep, in consequence of the pains, the uncertainty and the slowness of the labor, the patient may feel in her ordinary health. Matters

may not change much for two, three, or, in some cases, even six days. If, however, labor should have progressed pretty far into the second stage, the presenting part having passed, or nearly passed, through the superior strait, the membranes being ruptured, the os fully dilated, and perhaps retracted, when the *inertia* shows itself in a complete and, perhaps, protracted manner, the constitutional symptoms may assume a much graver character. This is particularly so if the inertia arises not so much from the want of original power, as from overexertion of the uterus and its accessory muscles, in fruitless efforts to overcome one of the numerous sources of obstruction that occasionally prolong, and sometimes render labor impossible, by the unaided exertions of the natural powers. In these cases of prolonged labor, whether inertia sets in or not, the skin becomes dry and hot, the tongue dry and parched, and sometimes brown, the pulse rapid, the woman restless and irritable, and the stomach unable to retain its contents. The vagina is no longer moistened by an abundant secretion of mucus, but becomes dry, hot, and occasionally painful and swollen. If relief be not forthcoming, these symptoms grow more and more intense, delirium sets in, and, ere long, death closes the scene.

TREATMENT.—In the management of a case of tedious or prolonged labor it is all-important to give due consideration to the causes so far as ascertainable. If it be owing to rigidity of the perineum or cervix uteri, to obstructing tumors, to deformed pelvis, mal-presentation, or similar obstructions and complications, we must be guided by the principles of treatment laid down in the chapter on "Obstructions to Labor." If the cause be a distended bladder or loaded rectum, the catheter or enema must be brought into immediate use; if there be an ante-version of the womb the woman should use an abdominal supporter when erect, and lie on her back when in the recumbent position. In lateral obliquities she must lie on the side opposite to the inclination of the uterus. If the pains are slight, irregular, but so frequent as to annoy the patient and make her nervous and sleepless for a night or more, a 15 or 20 grain dose of the hydrate of chloral, 15 or 20 drops of McMunn's elixir of opium, or chlorodyne, or gr. $\frac{1}{8}$ of one of the salts of morphia by the mouth, or a solution of gr. $\frac{1}{4}$ injected beneath the skin, will often enable the woman to get a few hours of refreshing sleep, when the pains are apt to come on

with renewed vigor. This treatment may be found useful during any part of the first and second stages of parturition. Sometimes changes of position, a cup of beef or other tea, gentle pressure over the stomach, or the insertion of the finger inside of the rim of the os uteri, being careful not to rupture prematurely the bag of waters, will stimulate by reflex action the womb into activity. It has even been recommended in those cases where the membranes, owing to some previous pathological condition, had become adherent to the uterus that the finger or a bougie might be inserted just inside of the os and the membranes separated for a short space all around. This, however, seems to be a doubtful procedure, and might cause a rupture of the bag of waters before the proper time. There are cases, however, where rupture of the latter is useful, such as dropsy of the amnion and great toughness of the membranes preventing their rupture at the proper time. As a prolapse of the umbilical cord might occur from a too rapid and copious flow of the liquor amnii, it has been suggested that the bag of waters should not be ruptured low down, but high up, and by only a small puncture.

External Pressure.—After the second stage has commenced, if the pains flag from simple inertia, and not from overexertion because of obstructions, complications, or deformities, we may try the effects of abdominal pressure as originally suggested by Ritzen in 1856, and put into practice by Kristeller eleven years thereafter. It consists in firm pressure through the walls of the abdomen upon the womb, by the hands being spread out upon its fundus and sides. The woman should be upon her back, and the pressure be made in the axis of the parturient canal. If, for instance, this measure be adopted while the presenting part is endeavoring to pass through the brim, the pressure should be downwards and backwards. Where uterine contractions are entirely absent, the pressure should be made rhythmically, with intervals of from five to twenty minutes, according to what the pains ought to be for the respective stage of labor. Pressure thus applied is intended as a substitute for oxytocics and the forceps, and ought, in suitable cases, be tried before their use. But no roughness should be permitted, or unnecessary delay, in order to supersede the use of the other means of relief. Pressure may not only be used as a substitute, but as an adjunct to oxytocics and instruments. The best time for using it is after the head or breech has

assed through the superior strait, and when there are no obstruc-
ons to the expulsion of the child.

FORCEPS.—There is no change in the whole range of the art and
ience of midwifery so great or remarkable as that of the use of
e forceps, especially in protracted labor from inertia.

While there is but little doubt that the Chamberlens, who re-
scovered this instrument, used it too frequently, it seems equally
rtain that the great body of physicians, particularly in Great
ritain and the United States, made use of it too seldom until
ithin the last few years. Some obstetricians are now perhaps
shing into the opposite extreme of employing it too frequently.
was not used in a single instance in over twenty-one thousand
bors in the Rotunda Hospital of Dublin, during the mastership
Dr. Labatt, while on the other hand Dr. Johnston, in seven
housand eight hundred and sixty-two cases, from 1868 to 1875,
ed it seven hundred and fifty-two times, or once in ten or eleven
ses, and Dr. Lombe Atthill, from 1875 to about 1880, made use
it once in fourteen "*in-cases*" and once in twenty-nine "*out-
ses.*" In New York and Philadelphia it has been used in the
ivate practice of some physicians as often as once in seven cases.
he forceps is particularly adapted to cases of inertia where the
ead has descended low down in the cavity of the pelvis.

In these cases we must not follow the advice of some of the
der writers of the present century, and wait until the head has
sted for six hours upon the floor of the pelvis after all pains
ave ceased, nor that of the most conservative of later authors,
ho refrain from its use until constitutional symptoms of exhaus-
on have commenced. Although no precise rule can be laid down
r the application of the forceps, it may be stated in general terms
hat whenever it becomes apparent that the powers of nature are
iling, and natural delivery cannot be effected, except at the risk
life to the mother or child, or both, by long delay, the forceps
ust be employed in all suitable cases, and no cases are better
lapted to its use than powerless labor, during the second stage
hen uncomplicated; but that its aid is often necessary even in
ses of prolonged labor from obstructions or slight deformities
the pelvis.

OXYTOCICS.—There is a very prevalent belief among lying-in
atients that the doctor has it in his power to retard or hasten
bor at will by the administration of medicine. This erroneous

opinion is very frequently the cause of much embarrassment to the conscientious physician, but is a decided advantage to the meddlesome charlatan to enable him to secure the confidence of ignorant nurses and credulous patients. It is true that a physician may retard or hasten labor to a reasonable extent by medicinal treatment. He obtains the latter effect by the use of oxytocics, such as rue, savin, gossypium, borax, galvanism, quinine, and ergot of rye or ergot of corn. All of the above remedies with the exception of the ergot of rye have only a limited or local reputation of parturients.

The sulphate of quinine in 15-grain doses, and the fluid extract of gossypium in doses of from half a drachm to a drachm, and the fluid extract of the ergot of corn (Ext. Ustilago Maidis Fluidi) are highly extolled by a few practitioners, and seem to be growing in favor, yet the ergot of rye is the only one of them all that has an old and general reputation.

It would be out of place to give here a therapeutical description of this drug, except to state that while many practitioners consider it powerful for both good and evil as a parturient, others have no confidence in its power to produce uterine contractions. Even those of the present day who have the most confidence in its efficacy to originate and increase uterine contractions limit its use so strictly that it is rarely given now in comparison to what it was a few years ago as an oxytocic, but its therapeutical range has been widened in other directions. The best authorities agree that ergot should only be given in the second stage of labor, and when the pelvis is roomy, when there are no rigidities of the parturient canal or serious obstructions of the soft or bony parts of the pelvis, and when the presentation is natural—in short when there are no obstacles whatsoever to the rapid delivery of the child, because they believe that much delay in labor after the administration of ergot would result in the arrest of hæmatosis, and probably in the death of the child from tonic contractions of the muscular fibres surrounding the bloodvessels of the uterus, or by direct pressure of this organ upon the body of the infant, or by the production of paralysis of the latter's heart, or by two, or all of these conditions in combination. Its use in short should be confined to those cases of inertia of the uterus in the second stage of labor, where nothing seems to be needed for a speedy expulsion of the child but an increase of uterine contraction. It is

ferred under these circumstances by some practitioners to the forceps, because of the danger of post-partum hemorrhage when the child is extracted from a non-contractile womb. Other authorities deem it good practice under these circumstances to give the ergot and use the forceps also, care being taken to time the administration of the former so that its full influence will not be exerted until just after the extraction of the fœtus. If uterine contraction should not take place in time to prevent hemorrhage, pressure upon the womb through the abdomen, and other means of preventing flowing must be adopted.

The most ardent admirers of the ergot of rye admit that owing to the uncertainty of its quality—as it is very perishable and only good when perfectly fresh—that its action cannot be fully depended upon, and that the forceps has often to be used when it has been given and failed. The fluid extract seems to be the least perishable, and most certain of all its preparations, and should be given in doses of from 20 to 30 minims every twenty minutes until the desired effect is produced. Squibb's aqueous extract of ergot in doses of 2 to 4 grains is a reliable preparation. His fluid extract in 10 to 20 minims is equal to f℥ss. of the fluid extract commonly prepared by others. Ergotine in 2-grain doses may be substituted.

Precipitate Labor.—Having discussed the subject of *tedious*, *tardy*, *protracted*, or *prolonged labor*, we shall briefly describe the converse condition of parturition,—*precipitate labor*. There are many degrees of this, and in its milder form it is generally attended with but little inconvenience to the woman and no danger. There are instances, however, where the pains are so unexpected, so strong, rapid, and even continuous, as not only to result in laceration of the perineum or cervix uteri, but of the womb itself, and to cause the child to be suddenly expelled upon the floor, or into the chamber-pot or privy pan, and in fact upon or into anything where the poor woman may chance to be standing or sitting at the time. I have known cases of this kind in second labors where from mal-presentation, mal-position, obstruction, or inertia, the first labor had been exceedingly prolonged.

The suffering, though short, is under these circumstances so intense as to cause convulsions, apoplexy, or mania. The death of the child in these cases has sometimes given rise to suspicions of infanticide, and the mother's conduct in the premises has been i ally investigated. It is well then for the medical witness to

know that the woman in some of these cases may not, until it be too late, be aware that labor has commenced, but may fancy that she desires to evacuate her bowels, and that the infant becomes suddenly expelled into the vessel upon which she happens to seat herself, and thus accidentally loses its life, or she may in a fit of irresponsible frenzy destroy the infant, or it might be born dead. It occasionally happens that the child is expelled before the head is freed from the womb by dilatation and retraction of the cervix uteri. In other words that a portion of the womb is forced externally still surrounding the head of the infant, and that judicious support of the same becomes necessary before the fœtus can be safely born.

CAUSES.—The immediate exciting causes of precipitate labor are numerous and variable. In a general way, however, it may be stated that there is either an excessive force and rapidity to the contractions of the uterus and the accessory muscles of the abdomen, or great laxity of the soft parts, with perhaps a roomy pelvis. The former conditions may arise from an overexcitable state of the nerves, especially of those belonging to the reflex system, and the latter from anything tending to relaxation of the parturient canal.

TREATMENT.—Even in these days of telegraphic and telephonic communication the practitioner can rarely respond to a summons in time to be of much service in retarding a precipitate labor, as he will generally find on his arrival that the child is born. If he reach the patient's bedside before this event it is his duty to administer by inhalation, chloroform, which from its rapidity of action and known power of retarding labor is in great emergencies probably the best remedy; still where labor is not likely to be over in less than eight or ten minutes or longer, the hypodermic injection of from $\frac{1}{8}$ to $\frac{1}{3}$ of a grain of one of the salts of morphia will be found by far the best agent of retardation. It is commonly of no avail to use any remedy by the mouth or rectum, as the action is entirely too slow for these rapid parturitions. The patient should be restrained from all efforts at voluntary expulsion and the use of all aids thereto, such as pressing the feet against a box or other fixed point, or pulling on to anything, or holding her breath by closing the glottis. If the uterus is partly forced beyond the vulva a T-bandage with a slit corresponding to the os uteri should be applied, so as to afford support to this organ while the child is being expelled through the os and the opening in the bandage.

CHAPTER XXVIII.

INVERSION OF THE UTERUS.

THERE are but very few physicians who ever have an opportunity of seeing a case of inversion of the womb. Nevertheless, it is such a formidable accident, and one so difficult to rectify in its chronic form, that no one ought to undertake the practice of obstetrics without a thorough knowledge of its diagnosis and treatment, so that reduction may be made immediately upon its occurrence; for a delay of a few hours often makes a great difference in the ease of its performance.

DEFINITION.—As its name implies, a complete inversion is simply a turning of the uterus inside out,—the internal, or mucous, changing place with the external, or peritoneal, membrane.

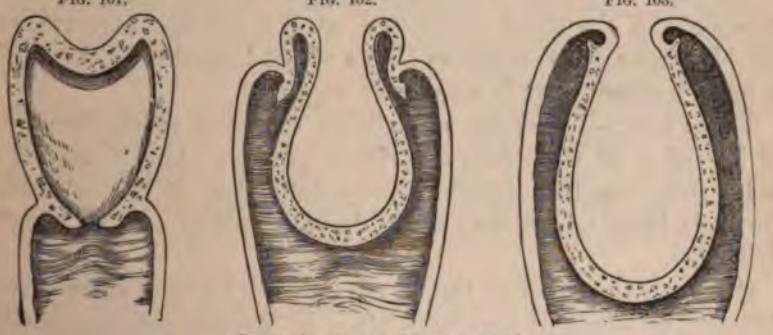
VARIETIES.—As the inversion may be arrested at any part of its course, it is possible to make almost an infinite number of varieties, but practically, it is better to consider only three.

1st. That of depression.

2d. Partial inversion.

3d. Complete inversion.

FIG. 101. FIG. 102. FIG. 103.



Successive Stages of Inverso-uteri.

In the first variety, the fundus uteri is merely depressed in the centre, as is shown in Fig. 101; in the second variety, it descends through the os uteri, to a greater or less extent, as may be seen in Fig. 102; in the third variety, the uterus is completely turned in-

side out, as is illustrated in Fig. 103. Besides these subdivisions, it is usual to divide the accident into the acute and chronic. It being considered acute if occurring within the first few hours after delivery; and chronic, if afterwards. The above are the varieties generally described in obstetric works, but there is another variety much rarer, and of much less practical importance, consisting of an inversion simply of the inferior part of the uterus (Fig. 104). This variety generally causes but little inconve-

FIG. 104.

Partial Inversion (after Mathews Duncan).

nience, and is very apt to rectify itself; but may possibly end in a complete inversion.

Dr. Taylor, of New York, believes that all spontaneous, active inversions of the womb commence at the inferior segment, and Dr. Matthews Duncan thinks that a slight inversion at the cervix is more frequent than is commonly supposed.

FREQUENCY.—There are no reliable statistics of the frequency of inversion of the womb in private practice; but, if we are to judge from hospital experience, especially that of the celebrated Rotunda Hospital, we may set it down at about one in 190,000 deliveries.

CAUSES.—Inversion of the uterus generally occurs shortly after delivery, although it may take place in the non-pregnant woman in its attempt to expel a polypus or fibroid tumor; or even, some think, by irregular contractions of the uterus, without the presence in its cavity of any offending substance.

When succeeding labor, it commonly takes place very suddenly and is the result of mechanical causes, such as undue traction

the umbilical cord, or improper pressure upon the uterus through the abdomen, or both combined. Inversion is more apt to result from pulling on the cord when the uterus is relaxed, especially if there should happen to be an adherent placenta. Fortunately, nature generally takes care of herself in causing the womb to firmly contract, immediately after the expulsion of the child, and she has endowed the organ with such delicate reflex sensibility that its power of contraction responds immediately to the stimulus of drawing upon the cord. If this were not so, inversion of the womb might be a much more common accident than it is.

Inversion may result from an irregular, spontaneous contraction of the womb. Although most authors believe in the possibility of spontaneous inversion from irregular contractions and relaxations, they have opposing views in regard to where these phenomena manifest themselves. One party maintaining that the contraction is always in the superior segment of the uterus, and the relaxation in the inferior or cervical portion; while another party takes exactly the opposite view, and asserts that the contraction is at the inferior portion, and the relaxation at the superior. The latter opinion seems to be the one generally received by the profession.

Under the head of mechanical causes, a precipitate labor, especially if the child is born and falls suddenly to the floor, while the woman is erect, occupies a prominent place.

Symptoms.—The first symptoms manifesting themselves to the attending physician are apt to be those coming under the head of nervous shock, such as sudden exhaustion, sinking, or fainting, a rapid, small, and feeble pulse, cold, sweaty skin, sometimes nausea, vomiting, and convulsions. There is generally excruciating abdominal pain, and more or less hemorrhage; the amount of the latter is often very great, and depends upon the degree of relaxation of that part of the womb that is not invested, and the extent of separation of the placenta; being greatest when these conditions are the most prominent. A physician having a patient with the foregoing symptoms, suddenly developed shortly after the birth of a child, would be considered very careless if he did not make a vaginal and abdominal examination, with the view of fully investigating the case. By the vagina, a hard, roundish tumor may be felt, to which the placenta may, or may not, be attached. The size of the tumor will depend upon the degree of inversion. It may, in partial or incomplete inversion, protrude only a moderate

distance through the os uteri, and occupy but a small part of the vagina. When complete inversion occurs, the entire vagina will be filled, and the womb in some instances may protrude beyond the vulva. The organ will present a globular, red, and bleeding surface.

A woman sometimes dies from the effects of the nervous shock or hemorrhage, or both combined, before the nature of her trouble can be ascertained or assistance furnished. Generally, however, when, for any reason, reduction be not accomplished, she recovers from the immediate results of the inversion, and regains a reasonable amount of, and, in some cases, almost perfect general health for a season, yet the hemorrhage is sure to return again and again, frequently at menstrual periods, and will undermine, in the course of time, her health very seriously.

Differential Diagnosis.—The incomplete or partial variety of inversion, bears a striking resemblance to a uterine polypus, especially of the fibroid kind, but may be differentiated by passing a probe between it and the uterine walls, when it is soon arrested in partial inversion, but passes much further into the cavity of the uterus in cases of a polypus.

This test is more decided and convincing in inversions immediately succeeding the birth of the child, as the cavity of the womb is then at its maximum length. A complete inversion is still more easy to differentiate from a polypus, because, in the former, there is no, or at least but little, fossa around the tumor. The presence of the womb in the hypogastric region, would help to decide in favor of a vaginal tumor being a polypus; and, on the contrary, its absence in that region at any time during the first week after parturition at the full term, would point towards an inversion. An inverted womb is much more sensitive to the touch than a polypus. A celebrated British accoucheur was once prevented by this fact alone from amputating an inverted womb by mistake for a polypus. This error has been committed.

A polypus gives to the touch a sensation of a solid mass, whereas, the inverted womb feels like a hollow organ. It is generally easy to distinguish a prolapsed or procident womb from an inversion, by the fact that in the former cases the os uteri is found at the most depending part of the organ. In the first variety of inversion the cup-shaped cavity of the fundus can sometimes be ascertained by conjoined manipulation.

TREATMENT.—It is fortunate, both to the patient and physician, if the nature of the trouble be ascertained immediately after its occurrence, for then the reduction is frequently very easy. Every minute's delay adds to the difficulty, for the os uteri gradually contracts more and more firmly around the organ, so that what might be an easy operation a few minutes subsequent to the inversion, becomes a most difficult, if not impossible, one within a few hours. The accoucheur's duty, then, is to attempt reduction of the fundus without a moment's delay.

If the placenta be adherent, it becomes a much-mooted question whether it should be detached before reduction or not. The replacement is more difficult with the placenta undetached, but the hemorrhage greater when it is separated. There are those who advise that it be separated on account of the first reason, and others who, for the second reason, insist on its being allowed to remain, and to be expelled after reduction. The most sensible course to pursue would seem to be to reduce the fundus with the placenta adherent, if it can be easily done, otherwise, remove it first.

As to the mode of reduction there are also various views, but the plan adopted by the majority of the more advanced accoucheurs of the present day is not to bring the fingers together and press the point of the cone thus formed against the centre of the displaced fundus, as heretofore generally recommended, but to grasp the inverted portion of the organ in the hollow of the hand and press it firmly, but gently, upwards into its position, being careful at the same time to make counter pressure with the other hand over the abdomen. By this method there is a lateral as well as upward pressure combined, and the part of the cervix which was last inverted becomes the first replaced, instead of the centre of the fundus being returned first as by the other method. In reducing an inverted womb care should be taken to push it in the direction of the axis of the pelvis. It may be well, especially in obstinate cases, to heed the advice of Dr. Barnes, by pressing up on one or the other side of the sacral promontory, as the latter sometimes becomes an obstruction to reduction in the ordinary way. If one plan fail, the other should be adopted. Occasionally a pressing of the displaced organ from side to side will overcome the difficulty in reduction and render it certain when all other means have failed. If the uterus be relaxed, the hand should fol-

low the fundus upwards and be allowed to remain awhile in the cavity of the womb until firm contractions become established. When there is no undue relaxation, however, the fundus will often after being reduced to a certain point return to its normal shape and condition with an audible snap like an inverted rubber bottle. Dr. Barnes advises an injection of dilute solution of the perchloride of iron into the cavity of the uterus when so relaxed as to endanger the return of the inversion. It acts by constricting the uterine walls.

In all cases where reduction of the fundus uteri is found to be impossible by the foregoing simple means, resort must be had to india-rubber bags passed into the vagina, then distended with water, and permitted to remain as long as necessary. If the bag interferes with the passage of the urine or fæces, the water must be allowed to run out until the necessary evacuation is accomplished. The water is easily replenished by the force-pump or syringe arrangement of the bag, and retained by a stop-cock. In recent inversions steady pressure can be kept up in this way for a day at a time, when the bag should be removed, and taxis, while the woman is under the influence of an anæsthetic, tried; and if reduction be not then possible, the bag can be cleansed and again introduced. It should be supported *in situ* by a **T**-bandage and compressed over the vulva and perineum. By this process an obstinate recent inversion can almost always be rectified within twenty-four hours. The same process is applicable to a chronic inversion. Yet in the latter it is probably unnecessary to remove the bag for purposes of cleansing or taxis oftener than once in two days, but of course the water must be drawn from it two or three times daily to prevent trouble in urination and defecation. Professor Lewis, of New Orleans, Louisiana, in a communication to the New Orleans Med. and Surg. Journal, March, 1880, in speaking of a recent reduction by this method of a case of complete inversion of fifteen months' standing after sixteen days' pressure, states that on introducing the bag the uterus should be well pushed up first, as otherwise the pressure is but slight upon the fundus, and the bag at the moment of distension may rise between the vaginal walls and the uterus, compressing it laterally.

It is unnecessary in an obstetric work to describe fully the various processes adopted for chronic inversion of the womb. The means already mentioned are used, among others, especially that

f pressure by rubber bags filled with water. When reduction roves impossible the case must either be left to nature, in the hope hat spontaneous reduction may occur, of which there are several emarkable examples upon record, or the womb may be amputated. The following extract shows that the latter operation may be successfully performed:

"FOUR CASES OF AMPUTATION OF THE INVERTED UTERUS.—The cases which are the subject of Dr. Vadiagin's report were from twenty-one to thirty-five years old, disease lasting from one to three and a half years, all of puerperal origin. Operation was called for by excessive hemorrhages resisting most energetic treatment, and by inability to reduce the inversion. The removal of the uterus was accomplished in each case by a wire ligature placed close to the cervix, and tightened every day until the organ dropped off. This occurred on the eighth, ninth, eleventh, and fifteenth days. In the first three cases fever was mild and septic, complications slight. But in the last one the ligature, on account of the severe pain, could not be made sufficiently tight, which occasioned slower separation and more marked constitutional disturbances. All recovered.—Meditz. Obozrenie, April, 1880."

CHAPTER XXIX.

RUPTURE OF THE UTERUS.

THIS is the most formidable and fatal of all the accidents of gestation or delivery. Although more frequent during the second stage of labor, it is not confined to the period of parturition, but may occur, though very rarely, in the early months of gestation, and somewhat more frequently during advanced pregnancy.

FREQUENCY.—There is a great diversity in the statistics of different authors as to the frequency of rupture of the uterus. Dr. Churchill, for example, gives the proportion in a large number of observations as one in one thousand three hundred and thirty-one, while Dr. Jolly, of Paris, states that it is one in three thousand four hundred and three. The latter author does not include ruptures of the vagina and cervix, and it is probable that the former does. Yet it is well known that the accident is more common in the practice of some physicians and hospitals than others. The difference as above given is, however, too great to be accounted for in that way.

SITE.—The accident may take place in any part of the womb, but is more frequent in the cervical region, and in the anterior and posterior, than in the lateral surfaces of this organ. It is really most frequent of all in the sub-vaginal part of the cervix, or that portion of the latter which projects into the vagina, or is below the insertion of the latter. More or less laceration of this part of the cervix occurs in almost every labor, and is hardly ever followed by any inconvenience. As many authors include this slight laceration of the os and cervix under rupture of the womb, I have mentioned it here, but shall make no reference to it in my remarks in the remainder of the chapter. Laceration may extend in any direction, but is most frequent in a vertical or longitudinal course. It may be only a slight rent, or may involve the whole length or circumference of the womb. It may pass through only the peritoneal or muscular coat, or, what is more common, all three coats. In some cases the neck is entirely separated from the body of the womb.

Is the Accident more common in Multiparæ?—It is generally asserted that rupture is more frequent in multiparæ than in primiparæ. Dr. Tyler Smith denies that this is so in a relative sense. That is, by comparing first labors with the second, third, fourth, etc., and not making a comparison between all primiparous and all pluriparous cases in a group, as there can be but one of the former, but may be quite a number of the latter, in each patient. Owing to the more frequent occurrence of pathological changes in subsequent labors than in the first, it would seem to be more probable that laceration should also be more frequent, even in the comparative sense in which Dr. Smith thinks the question should be propounded. However, an examination of the subject upon more accurate and extended statistics is necessary for a correct decision. In support of the belief of a greater frequency of rupture of the uterus in multiparæ, both in an absolute and relative sense, it may be remarked that Dr. R. P. Harris, of Philadelphia, states that in his collection of forty-one cases where gastrotomy (or laparotomy, as he calls it, though he prefers the term étronotomy) has been performed in the United States for rupture of the uterus, there was not one primipara in thirty-one cases where the number of the labor was given.

Causes.—The causes of rupture of the uterus are so numerous that only a few of the more prominent can be given in this work; and these may be the better studied by placing them under the heads of *predisposing* and *exciting*.

Predisposing Causes.—This division includes all those agencies that render the accident more liable when the determining cause is applied; such as excessive thinning of the uterine walls by overdistension from plural pregnancy, an excess of liquor amnii, intrauterine hydrocephalus, and complications with large tumors. The presence of the latter also act by the production of such pathological changes in the womb itself as to render it more brittle or less distensible, and therefore more apt to be torn, when even the necessary distension is required of an ordinary labor, and of course still more so when the distension is augmented by the presence of the tumors themselves. Scirrhus, encephaloid, and fibrous tumors are specially apt to give trouble in this way. Inflammation of the womb is also a predisposing cause; so is premature fatty degeneration.

Any obstacle to the passage of the child along the parturient

canal is also a predisposing cause. For example, rigidity of the cervix uteri or perineum, obliquities of the uterus, mal-position or mal-presentation of the child, especially a shoulder or transverse presentation, an excessive size of the fœtus or deficient capacity of the pelvic canal, particularly deformities of the pelvis. Dr. Murphy has called the attention of the profession to a partial atrophy of the uterus as a predisposing cause of rupture. Softening of this organ also plays an important part in this terrible accident. A previous Cæsarean operation may also be set down as a predisposing cause—the rupture taking place in the line of the uterine cicatrix. Dr. R. P. Harris states that "this has happened five times in the United States."

Exciting Causes.—The administration of ergot in unsuitable cases stands prominent among the exciting causes. So do falls, blows, and other external injuries. Undue force in the extraction of the placenta, or in the introduction of the hand or instruments into the womb; unskilful use of the forceps or other obstetric instruments. The womb has even been ruptured and lacerated by the use of the embryotomy forceps, and by the unskilful application of the hand in turning.

Symptoms.—These vary in character and intensity according to the causes producing the rupture, the stage of labor, and the extent of the laceration itself. In a complete rupture, occurring suddenly during a violent labor pain, the symptoms are generally very plain and characteristic. The patient experiences a sharp, cramp-like, tearing pain at the seat of rupture, and screams out in great agony. There is occasionally a sound of tearing or cracking, loud enough to be heard by persons surrounding the patient, whose pulse sinks, her countenance becomes pale, and assumes an exceedingly anxious expression, her respiration becomes quick and labored, the skin cold and covered with a clammy sweat, her stomach often rejects its contents, which, though at first natural, after awhile assume a coffee-grounds appearance; she becomes faintish, or may pass into a state of complete syncope or convulsions. The previous strong uterine contractions suddenly cease, hemorrhage occurs either internally or externally, or in both ways. The child will usually be found, by auscultation and the absence of motion, to be dead. By a conjoined examination the presenting part of the child will be found to have receded.

If the fœtus has escaped entirely into the cavity of the abdo-

men it can be readily felt in one place, while the partially contracted uterus may be discovered in another. The laceration, when extensive, may be felt by the tips of the fingers introduced through the vagina. A portion of the omentum or intestine is sometimes found protruding through the fissure into the cavity of the uterus. A diagnosis could readily be made out of the foregoing symptoms, but in many cases, especially where the laceration is slight, or only through one of the uterine coats, the symptoms are uncertain and exceedingly obscure. Under such circumstances there may be no external hemorrhage, no sudden retrocession of the presenting part, or cessation of the pains, which may be sufficiently energetic to expel the fœtus.

The practitioner must not place too much reliance upon any single symptom, or he may sometimes be unnecessarily alarmed. This is particularly so in regard to the sudden recession of the presenting part, which sometimes occurs to a considerable extent towards the termination of the second stage of labor after a very prolonged and exhaustive pain. If there be no other symptoms indicating rupture, this phenomenon need cause no alarm, as the uterus has only become temporarily exhausted, and after a little rest returns to its duty with renewed power, and the child is quickly born. On the other hand there may be rupture with the manifestation of only the sudden recession of the presenting part. The obstetrician may in this case, if not upon his guard, diagnose a uterine inertia and administer ergot.

If the patient does not die during the collapse, she may rally after sixteen or twenty hours; but if the rupture is at all great, and especially if the child has escaped into the abdominal cavity, symptoms of inflammation of the peritoneum or uterus, or both, will manifest themselves—such as a wiry, small, and quick pulse, acute pain, and great tenderness in the abdomen, hurried breathing, flexing of the legs, etc. These symptoms generally carry off the patient within a few days at furthest, though they may be followed by pelvic cellulitis and other secondary effects of inflammation, and destroy life only after a prolonged stage of suffering.

Prognosis.—The fatality of rupture of the uterus is exceedingly great, both to the child and the mother; the former almost invariably perishing, and the latter too, according to the general opinion of authors. Yet Jolly has given in five hundred and eighty cases one hundred recoveries, or about one in every six.

It would appear, from a late article by Dr. R. P. Harris,—referred to under the head of treatment,—that the prognosis to the mother is much more favorable in the United States in cases where gastrotomy has been performed; the percentage of recoveries being $50\frac{3}{4}\frac{3}{1}$. The prognosis is much better in country than city cases, especially after gastrotomy. This difference is partly dependent upon the more favorable hygienic surroundings of the country patients; but is also due to the fact that the poor of cities, who are especially the subjects of rupture, usually fall into the hands of a class of accoucheurs much inferior to those who attend the working people of the country.

TREATMENT.—Rupture of the uterus usually takes place so unexpectedly and suddenly that it is exceedingly rare that anything in the line of preventive treatment can be adopted. Where we have reason to suppose that the uterus has been weakened by appreciable pathological conditions, and an excessive contractile action should set in, we would endeavor to modify it by chloral, chloroform, or one of the preparations of opium. All rigidities and obstructions of the soft parts of the parturient canal must of course be removed as far as practicable; and in cases of pelvic deformities the necessary operation for the removal of the fœtus should be undertaken as soon as practicable with the view of preventing rupture, which might take place if the fruitless, violent contractions of the uterus should be permitted to go on. Further than such efforts as these we are powerless in our measures of prevention.

But what are we to do when rupture has actually occurred? Shall we follow the example of some of the older authors and do nothing; or that of others, and attempt to remove the child *per vias naturales* in all cases, whether the child be entirely in the womb or partly or wholly within the peritoneal cavity?

The most advanced modern physician would adopt neither of these extreme measures. He would of course always endeavor to remove the child and afterbirth, but not always per vaginam. If he found the fœtus lying chiefly or entirely outside of the uterus in the abdominal cavity, he would remove it by performing gastrotomy, and not endeavor to pull it back through the rent in the womb, and then through the parturient canal, as generally recommended by authors. Where the child is entirely within the cavity of the uterus he would endeavor to remove it through the natural

channel either by turning, the forceps, cephalotripsy, or craniotomy. But even when the child is delivered *per vias naturales*, and there is a decided laceration of the uterus in its upper part with an escape of much liquor amnii and blood into the cavity of the peritoneum, a prominent authority, Dr. R. P. Harris, advises gastrotomy to be performed for the removal of these fluids. His views upon this subject may be seen in his notes to Playfair's Midwifery, third edition, and in an extract from a late article by him, to be given further on.

If the fœtus occupies the womb and is above the brim of the pelvis, and any part except the head or pelvic extremities presents, and the pelvis is not too small or contracted, turning would be indicated. If the head presents and is within easy reach at the brim, or in the cavity, and the pelvis is sufficiently capacious, the forceps might be used; although if the child be dead, as is generally the case, the head, as a rule, should be perforated and extraction made by the cephalotribe, or regular craniotomy performed. These two operations are still more clearly indicated if, besides the child being dead, the pelvis should happen to be moderately contracted. Of course very great deformity, even when the child is entirely within the womb, would demand gastrotomy; or perhaps gastro-hysterotomy or its modification by Porro, when the opening in the womb is too small to permit the fœtus being extracted through it, as has been done with success, once in this country and recently in Holland. At least the laceration must be enlarged for this purpose. The womb must be well supported by abdominal pressure in all attempts of extraction of the child through the natural passages, especially in turning, cephalotripsy, or craniotomy.

When the child's head has descended into the cavity of the pelvis either of the last two operations or the forceps may be made use of, but turning is inappropriate. When intra-uterine hydrocephalus is the cause of rupture, the head must be tapped or perforated as a preliminary to delivery by the natural passages. A very interesting and instructive case of the kind will be found recorded on page 138 of the March number of the Obstetric Journal of Great Britain and Ireland for 1880.

Placenta.—If the placenta alone has escaped into the abdomen, it may, after the delivery of the child, be drawn back through the rent in the womb and removed through the parturient canal

by pulling gently upon the cord until the placenta is drawn close to the rupture, and can be seized by the fingers without the necessity of carrying the hand into the peritoneal cavity. The latter alternative becomes necessary when the cord is ruptured. When, however, both child and placenta escape into the peritoneal cavity they must be removed by gastrotomy. When the afterbirth remains in the womb after the removal of the child by the natural passages it should be gently removed by the hand.

AFTER-TREATMENT.—No special rules need be given for the management of a patient after the removal of the child in rupture of the womb. It is proper, however, to remember that the shock must be overcome by the adminstration of stimulants, the pain and secondary results counteracted by anodynes, etc.

DR. R. P. HARRIS'S SUGGESTION OF GASTROTOMY SIMPLY TO REMOVE EXTRAVASATED BLOOD FROM PERITONEAL CAVITY.—In connection with the treatment for rupture of the uterus, I desire to call attention to an extract from Dr. R. P. Harris's article on "Laparotomy for Rupture of the Parturient Uterus," published in the American Journal of Obstetrics, etc., for October, 1880.

After stating substantially that it will probably require some years yet, before gastrotomy (or *étronotomy* as he prefers to call it) shall become the general practice as a matter of election when the fœtus has wholly or in part escaped into the abdominal cavity, he remarks: "When that shall have been accomplished, I believe the profession will be prepared to practise the opening and cleansing of the abdomen after the fœtus shall have been delivered through the pelvis, as by the first and second rules of Playfair, in order that the woman may have the best possible chance for recovery. Whether suturing the uterus, as was done in case 39 of the table, shall also be recommended will depend upon its success in the meantime.

"If the fœtus is entirely or mainly in utero, there is no question but that it should be delivered through the vagina; but what are we to do to remove the blood that has passed into the peritoneal cavity? Does it not require removal in order to save the patient? Women do sometimes recover where no such effort is made, but they run a very great risk. Cannot something more be done to add materially to the safety of the patient? My studies in the abdominal surgery of women have very materially lessened my fears in opening the abdominal cavity. If the operation is

dangerous *per se*, how did Dr. Keith open 97 in 100 without causing death? It appears to me that he has satisfactorily proved that we may with considerable impunity open the abdomen, and cleanse it from foreign fluids by means of sponges wrung out in warm carbolized water, and this I believe should be done in many cases of ruptured uterus. But before we adopt so radical a change as this, we must make a step towards it by the much more general adoption of gastrotomy in those cases in which it has been recommended by Baudelocque, Hatin, Francis, of New York, James and Dewees, of Philadelphia, Trask, etc.; and is now by Playfair and Leishman. To further this end I have with much labor collected the statistics of this operation in the United States, and have arranged the cases in tabular form and in the order of their occurrence. I do not claim to have discovered every case, but after nine years' time I appear to have come to the end of the list." This collection now numbers 41 cases with 21 recoveries. The percentage of recoveries in American puerperal gastrotomies may be put down as a fraction over 50 per centum.

The allusion to Dr. Keith in the foregoing extract has reference to his opening the abdomen in ovariotomy operations. If it were always possible to secure as skilful an operator as Dr. Keith, and as healthy a climate as that of Scotland, the suggestion of Dr. Harris about performing gastrotomy even to remove extravasated blood would probably receive general approbation. But a serious drawback to its adoption is the fact that the great majority of operations of gastrotomy for ruptured uterus are necessarily performed by persons of only ordinary skill and experience, as the emergency generally arises at places where these are unobtainable. Still, Dr. Harris's great experience in collecting and analyzing the statistics of gastrotomy as a *preliminary* and *primary* operation entitles his opinion upon the subject to the highest consideration. Doctor Keith's habit of carefully removing all blood and extraneous materials from the cavity of the peritoneum after gastrotomy should at least be followed in all cases where the child is removed through the abdomen. The rent in the uterus should also be closed to prevent subsequent extravasation of blood into the peritoneal cavity.

CHAPTER XXX.

DEFORMITIES OF THE PELVIS.

THE important subject of pelvic deformity should properly be brought under consideration before that of obstetric operations, as the necessity for the latter often depends upon a deformed pelvis. Under the head of deformities of the pelvis it is customary to go beyond the strict etymology of the phrase and include all deviations from the natural standard as already described. The term therefore is made to embrace not only misshapen pelves, but those also which are symmetrical, provided they are much above or below the normal standard. As such a method of studying this difficult subject is more natural and convenient than that followed by some authors of making an elaborate classification and forcing all deformities under specific headings, I shall unhesitatingly adopt it.

EQUALLY ENLARGED PELVIS.—It might at first sight be presumed that the larger the pelvis the greater the convenience to the pregnant woman, as the child can meet with little difficulty in its expulsion. But it should be remembered that mere facility of birth is by no means the most important point in labor, for where the pelvis is too ample the woman is exposed to the dangers arising from precipitate labor, such as the partial or complete expulsion of the womb itself from the want of a proper osseous support, or at least a laceration of the cervix uteri, or perineum, or of both, because the rapid descent of the child prevents proper dilatation of these important structures. Also inversion of the uterus, rupture of the cord, a falling of the child upon the floor or in the water-closet may be the result of an over-capacious pelvis. This deformity is sometimes found of very great inconvenience to the pregnant woman even before parturition, and to the non-pregnant female too; but want of space forbids any examples to be given.

AN EQUALLY CONTRACTED PELVIS.—A pelvis may be perfect so far as shape is concerned, but so small as to give rise to the most serious difficulties of obstetrics. In fact although a too ample

pelvis may, and does occasionally, result in much inconvenience, it cannot for a moment be compared in this respect to a very contracted pelvis, which renders labor difficult and sometimes impossible without instrumental assistance of the most formidable character, such as destruction of the child, the regular Cæsarean operation or Porro's modification of it, or laparo-elytrotomy. An equally greatly contracted pelvis is fortunately very rare, so rare indeed that most of the English and French authors upon obstetrics before the time of Naegelé contented themselves with a bare allusion to the subject.

Distortions of the Pelvis.—Special deviations from the normal pelvis by distortion are much more frequent than the equally enlarged or the equally contracted pelvis. These deformities may occur in any part or the whole of the pelvis.

Rachitic Pelvis.—Deformities of the brim are the most frequent, and generally consist in an unnatural projection forwards

Fig. 105.

Rachitic Pelvis.

of the sacrum, or backwards of the symphysis pubis; although both of these abnormal conditions may be associated in the same person, as illustrated in Fig. 105. This figure represents a typical rachitic pelvis in which the antero-posterior diameter of the brim is shortened. The pelvic cavity may be deformed by the sacrum being either too much or too little curved, or by a forward projection of the ischial spines.

The inferior strait or outlet may be deformed by an anchylosed or too sharply curved coccyx, or by both combined; also by a too close approximation of the ischial tuberosities.

Malacosteon Pelvis.—Then again there is the malacosteon pelvis, as shown in Fig. 106. This is a type of special distortion from

the effects of malacosteon or osteo-malacia. The oblique diameters of the pelvis are shortened both at the brim and outlet, while the conjugate may be lengthened. There is also an approximation of the tuberosities of the ischia and the sides of the pelvis.

FIG. 106.

Malacosteon Pelvis.

OBLIQUELY CONTRACTED PELVIS.—Another very rare deformity is the obliquely contracted pelvis. This variety has a very serious effect upon labor, but unfortunately can rarely, if ever, be diagnosed previous to the birth of the child, because there is no apparent external deformity. The distortion essentially consists in a deficient development and flattening of one side of the pelvis, of an anchylosis of the sacro-iliac joint of the same side, and of the sacrum being carried towards the latter; while the pubic symphysis is pushed so as to be nearly opposite the sacro-iliac synchondrosis of the sound side.

FUNNEL-SHAPED PELVIS.—In this rare form of pelvic distortion the superior strait is of the normal size and shape, except that the antero-posterior diameter may be longer; the cavity is deeper and narrower, being gradually contracted in all its diameters from above downwards to, and including, the outlet. The contraction of the latter is chiefly owing to the approximation of the tuberositates ischii.

CAUSES.—No special causes can be recognized in the production of the equally enlarged or equally contracted pelvis. The rachitic pelvis is the result, as its name implies, mainly of rickets, a disease peculiar to infancy and childhood, manifesting itself in a softening of the bones, or rather in a deficiency of earthy matter in them,

thus leaving the bones soft, pliable, and subject to the influence of pressure, weight, or any force that may be brought to bear upon them, even that of the muscles surrounding or attached to the pelvis. The softening rarely affects continuously an entire bone, but may involve in a partial manner almost the whole skeleton, especially the pelvis and spine. Unless very severe, it never softens a bone already hardened, thus differing from osteo-malacia, which chiefly affects fully ossified bones. Other points of distinction are, that the latter disease occurs chiefly in adults, and affects the bones uniformly, and not merely in spots. It can easily be understood why the rachitic should differ from the malacosteon pelvis, when we remember that the rachitic child during the acute or softening stage of the complaint rarely walks, but occupies either a recumbent or sitting posture. When in the latter position the tubera ischii have a tendency to spread out, instead of approximating as in osteo-malacia—the approximation in the latter disease being produced by the pelvis encountering during the erect or walking position two opposing forces, that of the weight of the body acting through the spinal column from above, and the resistance of the inferior extremities from below acting through the cotyloid cavities. A rachitic pelvis becoming contorted during the softening stage must permanently retain the deformity if ossified when in that condition.

Muscular Action.—The action of the powerful muscles that have their origin or insertion in and around the pelvis, or pass over the same, must exercise a great influence in its distortion when softened by disease. Want of space forbids an analysis of the mode in which they act under varying circumstances.

Fractures of the Pelvis.—These sometimes result in deformity by the *callus* encroaching upon the cavity, or by the bones uniting in a contorted position.

Frequency.—Rachitis is much more frequently the cause of deformity of the pelvis than osteo-malacia—the proportion being about four hundred to one. There is a great variability in the prevalence of both diseases in different countries. They are more frequent on the continent of Europe than in Great Britain and the United States. In fact it is doubtful whether osteo-malacia in an extreme form has ever appeared in a native of the latter country. A few cases have been observed among the immigrants from foreign lands.

Pelvic Exostosis and Osteo-sarcoma.—It is customary to consider under the heading of deformities all kinds of osseous growths springing from and diminishing the pelvic cavity, especially exostosis and osteo-sarcoma. They may originate from any portion of the pelvis, but most usually arise from the superior part of the sacrum, and diminish the diameter of the superior strait and pelvic cavity. A projection of the promontory of the sacrum has been mistaken for these osseous formations about the brim. In a differential diagnosis it is therefore necessary to take the greatest care to avoid error. Besides an examination per vaginam and rectum it may become necessary to make an external measurement, which if normal would add to the presumption of the contraction of the brim being from a bony growth.

Diagnosis.—An accurate diagnosis of the nature and extent of a deformity of the pelvis is of the utmost importance. The readiness with which it can be determined is in proportion to its extent. When this is very great, it is easy, by an internal and external measurement, to arrive at a conclusion sufficiently accurate for all practical purposes of treatment; but where it is slight, it is sometimes impossible to do so. When the patient is in labor, and the head of the child pressing against the brim, cavity, or outlet, it is generally not very difficult to determine approximately at least the nature and extent of the deformity.

Measurements of the Pelvis.—As the diagnosis of deformity of the pelvis can only be definitely made out by measurement of some kind either before or during labor, it seems proper to describe here some of the various methods and instruments in use for ascertaining the shape and capacity of the cavity of the pelvis, or of its deviations from the normal standard.

Internal Measurements.—The finger or hand is preferred by most of the best accoucheurs for the internal measurement of the pelvis, whether the woman be in labor or not, because of the great complexity and cost of all pelvimeters, and the fact that they cannot be used without pain or injury to the woman. The patient may be placed in either of the obstetric positions, and an attempt made to reach the promontory of the sacrum with the index finger. If this can be done without the introduction of any other part of the hand into the vagina, it is proof of deformity, as the index finger is generally less than three inches in length and traverses not the true antero-posterior diameter of the pelvis, but the diagonal

conjugate, which is commonly reckoned as being a half inch longer than the true conjugate.

The student will remember that the diagonal conjugate extends from beneath the symphysis pubis to the promontory of the sacrum, while the conjugate extends from the top of the symphysis to the promontory. In passing the index finger of one, it is the custom to mark on it with the nail of the index finger of the other hand the part of the finger resting against the under surface of the symphysis. The distance between this mark and the tip of the finger, less half an inch, is the length that the tip of the finger passed in the conjugate diameter of the brim.

Where the index finger is too short to reach the promontory, the middle finger may be introduced with it, or the entire hand may be inserted and turned around in different directions—the patient being anæsthetized.

Dr. Ramsbotham's method of making an internal measurement of the antero-posterior diameter, by the introduction of the index and middle fingers, and spreading them out so that the tip of one may rest on the promontory of the sacrum, and the tip of the other behind the symphysis pubis, and then withdrawing them in the same position, so as to measure the distance between those points, is considered by most obstetricians as impracticable. The main objection to this method of Dr. Ramsbotham is, that it is impossible to withdraw the fingers precisely in their separate position, unless there is great distension or laxity of the perineum. Nevertheless, it is possible by thus separating the fingers in the pelvis to form a very good idea of the dimensions, because it is easy to make approximately the same separation of the fingers after their withdrawal from the pelvic cavity.

Pelvimeters.—Numerous instruments, called pelvimeters, have been invented for the purpose of measuring the pelvis. Some of these are intended for internal measurement only; others, termed the callipers, for external measurement; while others, again, combine the qualities of both pelvimeters and callipers, and are intended for both internal and external measurement. Among the instruments for internal measurement only, we may mention the pelvimeters of Coutouley, Lumley Earle, and Greenhalgh; for external measurement, Baudelocque's callipers; for both internal and external measurement, the pelvimeters of Van Huevel, Professor Byford, and Lazarewitch. Of course the *internal measure-*

ment is the practical one sought for, no matter whether it be ascertained directly by measuring inside of the pelvis, or indirectly and less accurately by deducting from an external measurement the thickness of the pelvic walls.

By far the most important measurement for pelvic deformities is the antero-posterior of the brim. For the internal measure-

FIG. 107.

ment of this diameter, Dr. Greenhalgh's pelvimeter, owing to its simplicity and facility of application, is considered by many of the most distinguished accoucheurs of Great Britain, as the best instrument. Another reason for their preference for this instrument is that it is only a supplement to, and not a substitute for, the fingers, which most British practitioners believe are better than any instrument.

Dr. Greenhalgh's pelvimeter (Fig. 107), as described by himself, "is intended for measuring, internally, the antero-posterior diameter of the pelvis at the brim. The principle of the instrument is to assist the finger in measuring this diameter. It consists of a band of flexible metal, one inch broad, which forms a ring. This band encircles the hand, passing across the centre of the palm, the size of the ring being adapted to different-sized hands by a piece of elastic india-rubber webbing. On the surface of the band, corresponding with the centre of the palm of the hand, is a projecting pivot, perforated so as to allow a small metal rod to traverse it. The rod is seven and one-half inches long, graduated along its central third; at its distal extremity it is bent at right angles into a form which admits of its sliding along the index or examining finger.

"It is to be used thus: The right hand having the instrument fitted to it, the forefinger or two first fingers are to be introduced so as to reach the sacral promontory. The curved extremity of the rod lies now on the radial side of the index finger. The promontory having been reached, the rod is drawn outwards until the ring-shaped extremity is arrested against the arch of the pubis. The hand is then withdrawn, care being taken to note the distance at which the rod is thus stopped, as shown on the index, and when the hand is withdrawn, the antero-posterior diameter of the pelvis can be obtained by measuring the length between the end of the finger and the extremity of the rod."

It was, at one time, thought possible to ascertain the conjugate diameter of the brim by deducting from an external measurement the probable thickness of the sacrum, pubis, and soft parts. This method is now considered too uncertain for practical purposes.

Measurements of an Oblique Pelvis.—This may be arrived at approximately, by an external measurement with Baudelocque's callipers, or any similar instrument, or, at least, it can be ascertained whether there be an obliquity. The principal points of measurement are:

1st. From the anterior-superior spine of the ilium, on either side, to the spinous process of the last lumbar vertebra.

2d. From the anterior-superior spine of the ilium on one side, to the posterior-superior on the opposite side.

3d. From the tuberosity of the ischium of one side, to the posterior-superior spinous process of the ilium on the other side.

4th. From the trochanter major on one side, to the posterior spinous process of the ilium on the other side.

5th. From the inferior edge of the symphysis pubis, to the posterior-superior spinous process of the ilium of either side.

If the oblique measurements of one side correspond with the similar oblique measurements on the other side of the pelvis, there can be no obliquity of the latter, but if they differ from each other, even so little as half an inch, there must be an oblique distortion.

Another way of ascertaining whether a pelvis be oblique is to drop a plumb-line perpendicularly from the spinous process of the last lumbar vertebra, and another from the symphysis pubis. When there is no distortion of the pelvis these two lines are precisely one behind the other; but when there is an obliquity, they are still parallel, but not exactly one behind the other—the anterior line deviating towards the sound side.

The pelvimeters of Doctors Lazarewitch and Byford are intended to take both the internal and external measurements, and are useful instruments in the hands of very careful and experienced accoucheurs, but their use is not so popular as that of the foregoing more simple instruments and the finger or hand.

Transverse Diameter of the Outlet.—It is quite easy to diagnose even a slight narrowing of the transverse diameter of the inferior strait, by its rendering the pubic arch more acute. This is plainly manifested when, during labor, the head of the child fits tightly between the tubera ischii, and yet leaves a free space between it and the pubic arch.

Treatment of Labor complicated with Pelvic Deformity.—A moderate degree of contraction of the pelvis is, by no means incompatible with natural delivery, especially if the child be small, but the greater degree presents the most serious of all obstacles to parturition.

However, even in the slightest forms of distortion, the labor is apt to be more tedious and painful than natural parturition in a normal pelvis, because the uterus and accessory muscles are compelled to contract with much more force than under ordinary circumstances, in order to expel the fœtus.

The proper management of the lesser degrees of distortion re-

quiring instrumental aid, but where the birth of a living child is not hopeless, has always been, and continues to be, one of the most vexed questions in the whole range of obstetrics. The means of relief at our command in such cases, are chiefly turning, and the use of the forceps, though craniotomy may occasionally be indicated, particularly where all the diameters, as sometimes happens, are contracted.

The measurement of the antero-posterior diameter of the brim in the minor cases ranges from three inches to the normal standard. If there be an abundance of room in the other diameters under these circumstances, as is generally the case, and the cranium not above the average size, either turning or the forceps is all that is required; and, in some instances, where the deformity is not great, the case can be left to the natural efforts.

Where the antero-posterior diameter of the superior strait is less than three inches and above one and one-half, a destruction of the child by craniotomy or some form of embryotomy is inevitable, unless the Cæsarean operation, or its substitute, be considered preferable. The latter operations are, however, generally reserved for those extreme cases of contraction, when the conjugate diameter of the brim is less than one and one-half inches, or, if a little longer, where the other diameters are contracted. In the minor degrees of pelvic contraction, the question of how far we may intrust the labor to the natural efforts, will, as before stated, come up for decision. Even in cases of considerable distortion, if the head be of moderate size, it often occurs that it becomes so moulded as to be born with safety to both child and mother. Such cases, however, require an intelligent oversight to insure the most successful results. The practitioner should have his instruments ready for any threatened failure of the efforts of the expelling powers, for any danger of rupture of the uterus, or of constitutional failure on the part of the mother. When relief is resolved upon in these minor cases, and the child is living, it often becomes a disputed point as to whether the forceps or turning should be resorted to. One class of practitioners use, almost exclusively, the former, while another class, equally intelligent, resort to the latter. This diversity of treatment among the experienced is most embarrassing to the young physician.

In the treatment of the minor degrees of deformity, those be-

tween three inches and the normal standard, where we have resolved not to trust to nature, but resort to either the forceps or turning, we may act according to circumstances.

If the child be above the brim, or not so wedged into the latter as to prevent the introduction of the hand into the womb, should this become necessary in case of failure to turn by both the external manipulation and the conjoined method; and should we feel satisfied that the after-coming head could be expelled after turning, it may be better to try turning, especially if the accoucheur is not skilful in the use of the forceps in these high operations. If, on the other hand, his experience in the application of the forceps to the cranium in, or above, the superior strait is great, this instrument should, as a rule, have the preference. When the head has entered the true pelvis, and particularly when it is low down in the cavity, if serious delay occurs, no matter where the deformity may be, provided delivery by the forceps is possible, this instrument must be used, as turning is inapplicable. This rule presupposes that the child is living; if dead, it may be removed either by the forceps, cephalotribe, or the operation of craniotomy.

In regard to the application of the forceps in cases of contraction of the pelvis we cannot follow the general rules laid down for its use in uterine inertia, or other similar requirements, but must apply it to any part of the head most accessible, and that part frequently is the occipito-frontal diameter, or to the forehead and occiput. Because we can generally get the most room for the introduction of its blades in the sides of the pelvis, and secure the firmest hold on the fœtal head, which lies in these cases of contraction of the conjugate diameter with its long diameter somewhat transversely. In the treatment of labor in pelvic deformities reference has been had to presentations of the head, as these are by far the most common forms, but the intelligent physican can have no difficulty in applying the general precepts here inculcated to other forms of presentation.

It is not often that the accoucheur is consulted about deformities of the pelvis, except at the period of expected labor, yet he may be called upon to give an opinion upon this point in reference to marriage, and also to the advisability of the induction of premature labor. These are delicate and responsible problems, the

solution of which is by no means easy. As to the first question, if after a thorough examination we feel convinced that the deformity is so great that the woman could not give birth to a living child *per vias naturales*, even by the aid of instruments, we should withhold our consent to matrimony. The second question will be discussed in the chapter on the Induction of Premature Labor.

CHAPTER XXXI.

THE FORCEPS.

NOTWITHSTANDING the senseless clamor that has been raised against the forceps by a few practitioners ever since its invention, it has been looked upon by the majority of the profession who have used it sufficiently to be entitled to an opinion upon the subject, as among the most useful instruments ever employed in operative midwifery. Prior to the invention of the forceps, the chief, and practically the almost only extracting implement known to the profession was a hook, intended for insertion into the head of the child, similar to the one used at the present day in craniotomy and cephalotripsy. Much of the opposition to the judicious use of the forceps has arisen from physicians being too timid or inexperienced to use it properly. It is seldom that a man of this kind will confess the real secret of his opposition, but I have met with examples, one of which I shall relate.

Being called in consultation with two other physicians to a case of prolonged labor, and finding the presenting head low down in the cavity of the pelvis, with nothing to prevent a natural termination of labor but uterine inertia, which could not be overcome by ergot, the question of the use of the forceps or the performance of craniotomy came up for solution. To my utter surprise, both practitioners advocated the latter. In the course of the debate they candidly acknowledged that they had never performed the operation, but had, under similar conditions, always recommended craniotomy, and were fearful that they could not use the forceps skilfully, and that they had, before I was called in, told the friends of the family that the child must be sacrificed in order to save the mother, and the use of the forceps after that would be a serious reflection upon their judgment. My reply in substance was that I had never seen a more favorable case for the application of the forceps; that I would assist either of them in its use, but rather than sacrifice the child under the circumstances I would withdraw from the case. It was finally agreed that one of their number should deliver the woman by the forceps while

she was fully under the influence of chloroform, and that no person but the nurse and the physician should be present. The operator could not introduce the instrument so as to lock it. I assisted him in this essential part of the operation, and the woman was delivered of a large, healthy boy. But this was twenty years ago, when forceps delivery was not so popular as at present. The doctor who so reluctantly performed the operation on that occasion has since then become an expert operator, and is now a more ardent advocate of the forceps than myself, for I may as well state here as anywhere else that my position upon this subject is by no means extreme. For I believe that the doctor who uses this instrument on an average of once in every four cases is almost as far wrong as he who employs it but once in a hundred, or not at all. An average of once in about twenty cases seems to me to be the happy medium. I consider Leishman nearer right upon this subject than Playfair.

The Chamberlens.—Nothing resembling the forceps was known to the ancient physicians in the time of Hippocrates and Celsus, nor indeed for many years thereafter. The Arabian physicians, however, about the eleventh or twelfth century, described, and were in the habit of using, an instrument, which, in the principle of its construction, is in all respects similar to the modern forceps. Yet during the dark ages this invention was lost to science, and it remained for a physician of the seventeenth century to make a rediscovery. This honor fell to the lot, not of Dr. Paul Chamberlen, as is generally supposed, but to Dr. Peter Chamberlen, who communicated it to his sons. Dr. Peter Chamberlen and his sons, Hugh and Paul, who were physicians also, kept the invention of the forceps as a profound family secret for their own benefit for many years. This has caused great censure to be heaped upon their heads, because it is in violation of that principle of medical ethics that no discovery or invention in medicine should be withheld from the public welfare.

What allowance ought to be made for the spirit of the times in which they lived, when monopolies in high places were more common than now, is a question for consideration in this connection. The secret of the Chamberlens gradually became known, but although the forceps was invented, or rediscovered, by Peter Chamberlen prior to 1647, it was not until 1733 that a description of it was published. This was done by Chapman, without any explana-

tion, however, whence he obtained a knowledge of the instrument. The fact that the Chamberlens had invented an instrument, unknown to the profession, by which they could deliver women more quickly and safely than other accoucheurs, gave them a great reputation all over Europe. One of the Chamberlens desired to avail himself of this renown by selling to various medical men his secret. With this object in view he visited Paris in 1670 and endeavored to negotiate a sale to the king's chief physician for ten thousand crowns. Unfortunately for him, he claimed to be able to deliver any woman, no matter how small or deformed her pelvis might be. A case for trial was furnished him, on whom the Cæsarean operation was considered by Mauriceau necessary. Chamberlen declared his ability to deliver the patient in fifteen minutes. After an unsuccessful effort of several hours he abandoned the case. The woman died twenty-four hours thereafter. In consequence of this failure he was unable to dispose of his secret, and returned to England. He subsequently visited Holland and succeeded in the sale of several of his forceps to a few of the leading Dutch physicians, who also kept the instrument a secret.

Varieties of Forceps.—As up to the present time forceps have almost universally been considered as applicable to the head only, I shall describe the regular instruments first, but shall at the end of the chapter call attention to an instrument of late invention, called the "breech forceps."

There are two principal varieties of forceps, called the *short* and the *long*, the difference in length generally having reference chiefly to the handles, except as to the English instruments, which vary both as to length of blades and handles. The length of the short forceps is generally about eleven inches, and that of the long forceps about fifteen and one-third inches. The forceps having the single or cephalic curve only is called "straight forceps," as the blades are in the same direction as the handles, in order to distinguish it from that possessing both the cephalic and pelvic curve, and named the curved forceps. The names of "single curved" and "double curved" forceps are also applied to the respective instruments.

The forceps invented by the Chamberlens, and its modifications up to the time of Levret and Smellie, were short and straight. The long forceps was then introduced, and about the same time the second or pelvic curve. The invention of these two modifications is accorded to both Levret and Smellie by their respective friends

Dr. Benjamin Pugh, of Chelmsford, Essex, England, is also a competitor for the honor of the invention of this curve. The pelvic curve is considered by most modern accoucheurs as essential to the long forceps when used for high operations, to which this instrument is particularly adapted. It has also been applied to the short forceps. As the latter instrument is restricted in its application to the head when it has passed through the superior strait and lies either in the cavity of the pelvis or at the outlet, the second curve is by no means essential to it, and might be objectionable when the forceps is required to facilitate anterior rotation of the occipito-posterior positions of the head. Generally, however, the second curve is not inconvenient, and is sometimes useful even in the short forceps. It is indispensable to the long forceps in order to prevent injury to the perineum, when the instrument is applied to the head above the brim, because in passing the blades in the axis of the superior strait the handles must be carried so far backwards that were there no pelvic curve to the blades the perineum would necessarily be lacerated. This danger does not exist in the use of the double curved instrument, for while the blades may be in the axis of the superior strait, the handles will occupy the axis of the inferior strait, or an approximation thereto. It seems very surprising that such a distinguished author as Churchill should use the following language in reference to the pelvic curve: "The second curve had been added both to the long and short forceps. I do not believe that it is advantageous in either kind; in the latter it is often very inconvenient. It is far better to have both these instruments perfectly straight, the diversity of curves recommended by different writers answering no useful purpose."

There are at the present day but very few supporters of this author's objections to the pelvic curve; most authorities insisting that it is essential in the long forceps for high operations in order to prevent lacerations of the perineum, as just stated. It is the opinion of many accoucheurs, in which I fully agree, that the long forceps, with the cranial and a moderate pelvic curve, is applicable to delivery at the outlet, and in the pelvic cavity as well as at, or above, the brim, and that the practitioner could very well do without the short instrument, either straight or curved, in his obstetric bag. There are only two conditions, and they exceedingly rare, where the single curved might take precedence over the double curved instrument. Allusion is made to where rotation by the

forceps is indicated in occipito-posterior positions of the cranium, and in fronto-anterior (or mento-posterior) of the face. Even in these the forceps with a moderate pelvic curve may be used. If the curve, when the rotation is nearly completed, gives annoyance and trouble by its convexity being forward, the forceps can be withdrawn at the proper time and reintroduced with the concavity forwards; but this necessity can hardly ever arise in the use of forceps possessing only a medium pelvic curve.

It is also the custom of a few accoucheurs to have in their obstetric cases not only a pair of short and long forceps, with and without the pelvic curves, but also a pair of very light small forceps with both curves. The latter is intended to facilitate labor when the head has descended to the inferior strait, and the pains are slightly sluggish. Judging from the various modifications of the forceps, it would seem that almost every accoucheur having any pretensions to distinction deems it necessary to compile an instrument of the kind. He is content if he succeeds in making a slight change in the curves, the length of the blades, or the handles, or the width of the fenestræ, or the locks. These changes are embarrassing to the student.

Long Forceps.—As a sample of the long forceps with moderate double curves, I shall describe that of the lamented Elliot, of New York, which combines everything essential in an instrument of the kind. For information to the student, however, I shall state that all forceps essentially consist of two branches, each of which has a handle, lock, shank, and blade. The latter, in the so-called straight forceps, has but a single curve, the cranial, adapted to the convexity of the child's head; while the double curved instrument has an additional, or pelvic, curve to correspond to the curve of the sacrum —the convexity being placed towards the latter when the forceps is introduced. Each blade has a fenestrum or opening for the purpose of receiving the parietal or other protuberances of the head, and giving a firmer hold upon the latter. The blade intended for introduction into the left side of the pelvis is called the left hand, or male blade, and that for insertion into the right side of the same, the right hand, or female blade—though the names male and female are reversed by some authors.

Elliot's Forceps.—The Elliot forceps (Fig. 108), as found in Professor Thomas's Obstetric Bag, is superior to that in Elliot's Set of Obstetrical Instruments. It is what may be called a long

double curved forceps. Its length from the end of the blades to that of the handles is fifteen and one-half inches; from the extremity of the blades to the lock, nine inches. The ends of the blades are nine-sixteenths of an inch apart. The greatest distance between the blades is two inches and three-quarters. The blades are steel; the handles, part steel and part wood, and terminate at their upper extremity in hollowed transverse projections or shoul-

FIG. 108.

Elliot's Forceps.

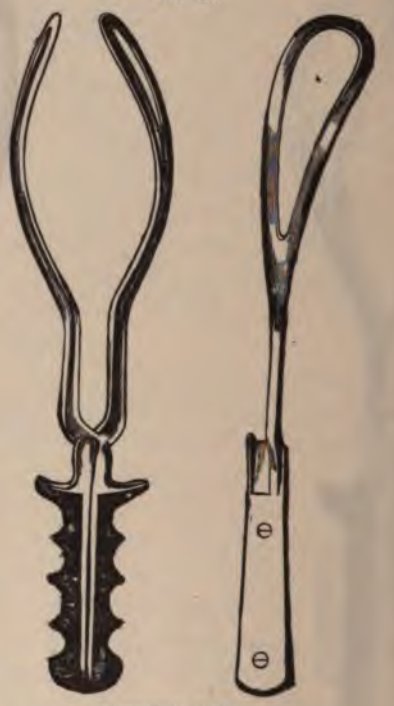
FIG. 109.

Hodge's Forceps.

ders, so as to form a hold to the index and middle fingers when the handles are grasped by the hand and traction made. The outer or wooden portions of the handles are notched at intervals to afford a secure hold to the hand. At the end of the handle of the right or female branch is a bolt which can be screwed out or in by a burr, thus separating or approximating the blades at pleas-

ure within a range of an inch and a quarter above the usual gauge of their extremities, as given above. It has an English or Smellie lock. The length of the fenestrum is four inches and a half, and its greatest breadth one inch and a quarter. Instead of leaving the power of compression to be regulated entirely by the hands of the operator, as is the case in forceps generally, it may be limited and controlled at pleasure by the bolt in the handle. But the practitioner should be careful in the regulation of the compressing

FIG 110



Simpson's Forceps.

power of the instrument, or he may, while endeavoring to avoid too much compression, allow the forceps to slip during the most important part of the operation.

Although I believe that the Elliot forceps is somewhat preferable to any other instrument of the kind in use, I would not for a moment desire to underrate the very excellent forceps of Hodge (Fig. 109), Wallace, Smith, Robertson, Simpson (Fig. 110), and others, especially the Tarnier forceps, as modified either by Dr. Richard

A. Cleeman, of Philadelphia, or Professor W. T. Lusk, of New York. Neither Elliot's nor any other forceps now in use combines much that is original, but is almost entirely constructed upon the essential principles discovered from time to time by different persons since the days of the Chamberlens. It contains, for instance, the English, or Smellie lock, the pelvic curve of Pugh, Levret, or Smellie, the length and shape recommended by many accoucheurs for long forceps, and the combination of metal and wood in the handles as advised by nearly all British and American authorities. It is of course a vast improvement over the very simple instrument of the Chamberlens, which was a short forceps with only a single curve—the cranial—a rude kind of lock when compared with Smellie's, or the French pivot, or the German lock.

Short Forceps.—The short straight forceps is still used by a great many accoucheurs in preference to the long instrument with the double curve, or even the short one with the double curve for delivery when the child is low down in the pelvis, or at the inferior strait. Leishman, for instance, advocates its use under these circumstances, and believes that it is absolutely essential when assistance by the forceps is necessary in rotating the face forwards, in mento-posterior (fronto-anterior) positions of the face, or in aiding the anterior rotation of the occiput in occipito-posterior positions of the head. With due deference to such distinguished authority I repeat that, in my opinion, the practitioner needs but one kind of forceps, and *that* a long instrument with a double curve, the pelvic one being moderate. The Elliot forceps would answer the purpose.

Action of the Forceps.—There are three different ways in which this instrument acts:

First. As a tractor.

Second. As a lever.

Third. As a compressor.

As a Tractor.—By far the most useful quality of the forceps is traction, which is sufficient of itself in most cases. It is intended as a substitute for, or an accessory to the expelling force of normal parturition. Where parturition is prolonged simply on account of uterine inertia, traction alone is all that is needed to complete labor. And so in hemorrhage, or convulsions, and other cases where a quick expulsion of the child is important, but where there are no great obstructions or deformities of the pelvis.

As a Lever.—When labor is rendered difficult by impaction of the head the usefulness of the forceps may be increased by oscillating it gently from side to side, thus bringing to bear upon the presenting part the action of a double lever. This movement should be executed cautiously and only to a limited extent, or serious injury may be inflicted upon the child or mother. When thus used the forceps is more apt to slip than when traction alone is employed.

As a Compressor.—The compressing power of the forceps, other things being equal, is in proportion to the length of the handles from the lock, and the closeness of the blades to each other. There is a great difference of opinion as regards the usefulness of this action. Many physicians contend that in proportion as one diameter of the head is decreased by compression another will be increased. It is often the case that compression cannot be applied to that part of the head where it is most needed. For instance, when the upper strait is narrowed in its antero-posterior diameter, compression to be of service ought to be applied in the same diameter, but this could not be done without serious risk to the mother's soft parts, particularly the bladder by the anterior blade, and the soft parts over the promontory of the sacrum by the posterior blade of the forceps. It is moreover very doubtful in cases of prolonged labor, where the head, as is generally the case, is already moulded to the pelvis, whether or not further compression is compatible with the safety of the child's life.

Some accoucheurs contend that the blades should be so wide apart when locked that no compression can be exerted, and the head be allowed to rotate at pleasure within their grasp. These extremists appear to overlook the fact that however wide the blades may be apart near their middle, when powerful traction is made the same near their extremities must by the *vis a fronto* itself be made to press or compress the head, otherwise the instrument would slip. It seems therefore the most sensible course to use a pair of forceps of good compressing power even for the purpose of securing a firm grasp upon the head. Of course the practitioner with only this object in view would regulate the pressure accordingly, and use no more force than is absolutely necessary.

Cases Requiring the Use of the Forceps.—This instrument is often needed in tedious labor arising from uterine inertia. It is sometimes useful in moderate contraction of the conjugate diam-

eter of the brim, or in a slight deformity of the outlet or the cavity, also in hemorrhage and convulsions. Its use may be required in obstruction to labor by the soft parts of the mother or by tumors. It is occasionally, though rarely, required in rupture of the uterus, where the child still remains in the cavity of the uterus, in some cases of prolapse of the umbilical cord, and in a few of placenta prævia. It is also at times very serviceable in extracting the after-coming head in pelvic presentation, or after turning by the feet. When required under the latter two circumstances it is generally owing to dangerous compression of the umbilical cord between the child's head and the pelvis. The latter cases point out the necessity of the accoucheur always having his forceps with him when in attendance upon midwifery cases, as he has no time in dangerous detention of the after-coming head to send for it, and a delay of only a few minutes is generally fatal to the child. I have on several occasions saved its life by such precaution, and have on the other hand known it to be sacrificed in the practice of others, by the delay in procuring the instrument.

The forceps is applicable not only to difficult vertex presentations and the after coming head, but to presentations of the face, especially the two fronto-posterior (mento-anterior of most authors), when labor is unduly delayed by uterine inertia, slight contraction of the pelvis, impaction, tumors, or in short when any of the emergencies, such as great hemorrhage, convulsions, or any other cause giving rise to a necessity for forceps operations in vertex cases is present. The student must not fall into the error of supposing that all face presentations require the use of the instrument simply because they are face cases, for the two fronto-posterior (mento-anterior of some authorities), and even the fronto-anterior positions, when anterior rotation of the chin occurs, come under the head of natural labors, and, as just stated, require the assistance of the forceps for the same reasons only necessitating its use in presentations of the vertex. It may be useful in assisting rotation of the chin forwards in the two fronto-anterior positions of the face after other means have been tried in vain; but the fingers are commonly preferable in these cases, and must be tried first. This instrument is also indicated in both cranial and face presentations where the proper diameters of the head and pelvis are opposed, the occipito-frontal of the former lying in the antero-posterior of the latter. Also when there is a slight dis-

proportion between the pelvis and head so as to prevent, or dangerously prolong natural labor, and yet not too great for the extraction of the latter by the forceps. It may be used to expedite labor where some other part presents with the head, as the cord, foot, or hand. In the latter case, however, and in all cases before mentioned where the head has not passed through the superior strait, the question as to which is preferable, the forceps or turning, may come up for consideration. It is difficult to give any specific rules for a selection under these circumstances. Neither operation is applicable where the conjugate diameter of the pelvis is less than three and a quarter inches. As a rule even in cases where the forceps is likely to be indicated, the powers of nature must be trusted to for awhile Exactly how long we may rely on nature, is also a disputed and difficult problem. It is the practice of most of the advanced modern accoucheurs to interpose much earlier than was the custom in the time of Denman, when it was laid down as a rule that in protracted labor from uterine inertia, the head must rest on the floor of the pelvis six hours after the cessation of the pains before the forceps should be applied. Many old authorities would not permit its application until signs of exhaustion had set in and nature seemed unable for the emergency. It was also laid down as a rule that the os uteri must be fully dilated. All these rules are disregarded by the modern accoucheur, who never waits long after the head has descended into the cavity of the pelvis if the pains flag, or the patient shows signs of approaching exhaustion. The actual condition of exhaustion is never allowed to take place if the patient is seen in time to prevent it by forceps delivery.

And, while it is preferred by him that the os uteri should be dilated, and even retracted so that the forceps may not be passed into the womb itself, he considers that emergencies may arise necessitating its employment when the os is only sufficiently dilated to allow the insertion of the forceps. This, too, in rare emergencies, even in slight rigidity of the os uteri, which all of the old, and many, if not the majority, of the present generation of practitioners, consider an absolute contraindication to the application of the forceps.

I have followed the custom of Doctors Tyler Smith, Johnston, Athill, Cranny, Barnes, and Playfair, in cases of undilated os uteri, where, after trying unsuccessfully all available means for

complete dilatation, and finding the signs of exhaustion approaching in the mother, I have introduced the forceps so soon as it was possible to insert the blades within the os, and by slow and gradual traction, delivered her without any subsequent bad symptoms. In this connection, it must be borne in mind, that the forceps is a much safer dilator than is generally believed; and that laceration of the cervix is nothing like as dangerous in the way of shock, hemorrhage, or subsequent inflammation of the womb as tearing of the womb higher up.

An interesting discussion of this subject by the London Obstetric Society may be found in the July, 1879, number of the Obstetric Journal of Great Britain and Ireland, the question, as put by Dr. Barnes, being: "Is the application of the forceps ever necessary or useful before the full dilatation of the cervix uteri?" The question was fully and ably debated by many of the leading accoucheurs of Great Britain, the responses being almost unanimously in the affirmative.

The following important extracts from letters of Dr. Johnston to Dr. Edis were read by the latter gentleman:

"I beg leave to say, in answer to the first query, I consider that the forceps is necessary and useful before the os is fully dilated, in order to avoid danger to the mother, in cases where the liquor amnii has escaped at the commencement of labor, which would otherwise accrue by the pressure of the child's head upon the cervix, particularly when it is retained at the brim, and more so where, through any cause, there may be delay. This danger may also occur in cases where, although the membranes are unruptured, the waters remain above and the fœtus descends upon the cervix. In such cases the forceps is equally necessary, as by its timely use you prevent the liability to inflammation and sloughing, and, mayhap, complete separation of the cervix from the body of the uterus, and death, as in one instance occurred with myself, and was the reason which induced me to adopt the method. The danger to the child, particularly when the liquor amnii has escaped, is from the frequent uterine action of the labor-pains, producing compression of the placenta to such a degree as to prevent the circulation of blood through the organ, and this causes the death of the fœtus. Another reason for the timely aid of the forceps is in cases of extremely nervous, delicate females, so ill able to bear

the exhaustion and fatigue of the labor-pains (even though they may not be protracted to any lengthened period), and from which they so slowly, and with such difficulty are brought to convalescence. In such cases the early application of the forceps is attended with the most beneficial results, as I have frequently experienced. These, among others, are the principal reasons why I advocate the measure. I may add, that since the expiration of my mastership of the Rotunda Lying-in Hospital, in 1875, I have performed the operation in several instances under the foregoing circumstances, and have every reason to say, that the more I have done so, the more am I convinced of the great advantage I have derived from the practise."

Consultation and Anæsthetics.—The question of consultation with a brother physician for the purpose of advising and aiding us, and dividing the responsibility, will arise in all forceps operations. Although I have never asked for consultation, except in the most difficult cases, I deem it the part of prudence for the medical attendant, especially a young man, to do so. This is still more important if an anæsthetic, such as ether or chloroform, is administered. For no one but a medical man can properly attend to the inhalation of these agents, and the one who is applying the forceps should not, in justice to his patient and himself, attempt both duties.

The only apology I can offer for my inconsistency in not practising in accordance with my recommendation is, that good luck in a few of my early forceps cases emboldened me to hazard too much in subsequent ones; but I can plainly see that had misfortune attended me in any of my operations, that I might have suffered both in reputation and fortune, so I will endeavor hereafter to follow my own precepts.

As to the propriety of using an anæsthetic in delivery by the forceps, there is much difference of opinion, but I agree with those who refrain from its use in simple cases, but administer it to the full surgical extent in such cases as are difficult; and although I have never experienced any bad results from chloroform, I have latterly fallen into the habit, to a great extent, of using ether instead, because of its supposed superiority in point of safety; yet I consider the present clamor against chloroform as calculated to unjustly prejudice the public against a highly valuable agent, and think the time will come when ether will be

condemned in the same unjust manner, because of a few deaths in many thousands of cases of inhalation.

Dr. Laurence Turnbull, of Philadelphia, has lately called the attention of the profession to the inhalation of hydrobromic ether in labor. He considers it a very valuable and safe agent. In the first case of parturition in which he tried it, he used a tablespoonful during each of several very intense pains, or a total quantity of five tablespoonfuls during the labor. He states that it gave as prompt relief as ether, and did not retard labor in the least, and that the patient suffered no ill effects from it. More recent experience in the hands of Dr. Levis, of Philadelphia, shows that the use of this anæsthetic may be attended with very fatal results.

Shall the Assent to the Operation be Obtained from the Patient or her Husband?—If the patient is conscious and in her right mind, her concurrence in the use of the forceps is important and generally necessary. If she should be mentally or physically unable to answer for herself, her nearest relation or friend—the husband if present—should decide for her.

Shall the Forceps be Shown to the Patient.—The medical profession are about equally divided upon this subject. My own experience would dictate that it should be shown to her, but that she should be informed of its harmlessness when properly used, and that it is only a pair of artificial hands, which will injure neither the child nor herself, but, on the contrary, be the means of saving the former, and relieving the latter of much suffering.

Position of the Patient.—The favorite position of the patient during the application of the forceps, on the continent of Europe and in the United States, is upon her back, across the bed, with her legs and thighs flexed and widely separated, and her buttocks close to, and in high forceps operations projecting over, the edge of the bed, and her feet resting each upon a chair. The lower limbs should be held in position by two assistants. In Great Britain the orthodox position is, as in ordinary labor, upon the left side.

Bladder and Rectum.—Before the introduction of the forceps the bladder and rectum must be attended to. An elastic male catheter ought always to be introduced into the former to make certain of its complete evacuation. The latter may, if containing fæces, be emptied by an enema of soap and warm water.

THE APPLICATION OF THE FORCEPS.—The forceps must be placed in a basin of tepid water, one blade removed at a time just previous to its introduction, wiped dry and anointed with cosmoline, vaseline, lard, sweet oil, or cold cream. As the straight forceps is rarely used, and the long, double-curved instrument can be applied to advantage to all parts of the cavity of the pelvis, and to the inlet and outlet, I shall describe the introduction of this instrument only; but, before doing so, must notice an important difference in practise between accoucheurs as to whether it is preferable to introduce the blades in reference to the sides of the fœtal head, or the sides of the pelvis. The great majority of American physicians, following the teachings of Hodge, Meigs, Elwood Wilson, A. H. Smith, and Goodell, apply the blades to the sides of the child's head, no matter whether the latter be below or above the superior strait. Some authorities, however, like Hodge, make an exception to this rule when the head occupies a transverse position at the brim, on account of the difficulty of application of the instrument, and extraction of the child, and the danger of wounding the soft tissues over the sacral promontory and the bladder, in applying the forceps in the conjugate diameter of the brim in order to adapt the blades to the sides of the head.

Drs. Barnes, Playfair, and other distinguished British authors, in conformity with the teachings of most German authorities, advise the instrument to be introduced solely with reference to the sides of the pelvis in all positions of the head, and in both stages of labor. The application of the instrument to the sides of the pelvis is calculated from its simplicity to grow in favor, but the promulgators of this advice will find that in proportion to the favor it receives will be the decrease in the knowledge of the mechanism of labor by those who practise it. For the student will be slow to learn the exact position of the head in the successive steps of parturition if the forceps may grasp it in any direction, so the instrument is applied to the sides of the pelvis. My advice to the practitioner is to study carefully the position of the presenting part, and apply the forceps when possible to the sides of the child's head, except when the latter occupies a transverse position at the brim of the pelvis.

WHICH BLADE SHALL BE INTRODUCED FIRST?—In answer to this question we have Velpeau and Cazeau as authorities for the introduction of the posterior or sacral blade first, while Madan

Lachapelle directs that the blade which is the most difficult of application should be introduced first, no matter whether it is the pubic or sacral blade. Following the advice of Hodge, we think it advisable, as a general rule, to introduce the *male or left-hand blade* first without regard to its being, when in place, near the sacrum or the pubis, as we believe that there will be less difficulty in locking the instrument. Of course, by following this rule, the left-hand blade when introduced will sometimes be towards the sacrum, as in the left occipito-anterior position before rotation has occurred, and sometimes towards the pubis, as in the right occipito-anterior position of the unrotated head. The male or left-hand blade is the one that is introduced in the left side of the pelvis, and the female or right-hand blade is the one introduced into the right side of the pelvis. As already stated, a few authors call the left-hand blade the female, and *vice versa*.

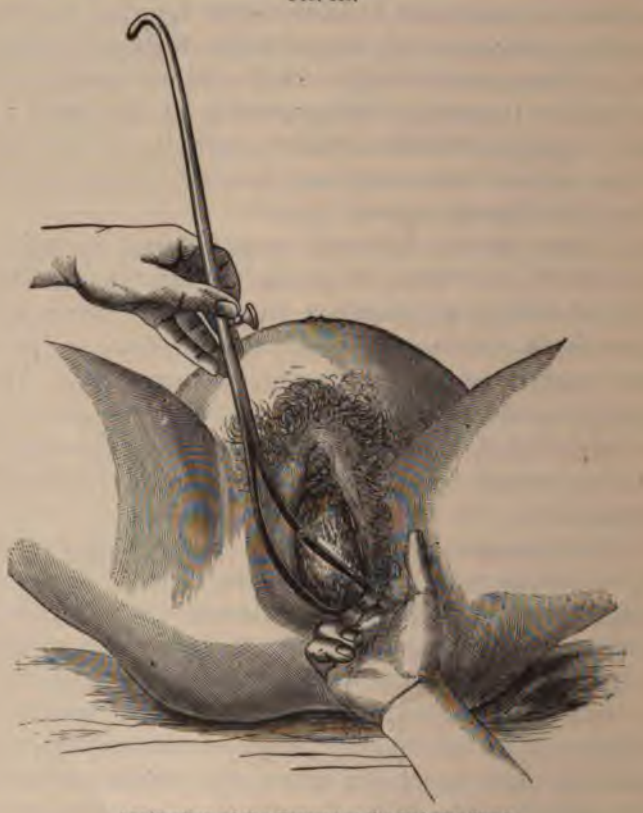
Application of the Forceps after Anterior Rotation of the Occiput in all Four Positions of the Head.—The most simple of all forceps cases is where the head has descended to, or almost to, the floor of the pelvis, and rotation of the occiput under, or nearly beneath the symphysis pubis, has taken place. It will be remembered by the student that at the latter part of the second stage of labor, anterior rotation of the occiput nearly always takes place in the first and second, and generally in the third and fourth, cranial positions.

In the two posterior positions, however, the occiput sometimes rotates backwards into the hollow of the sacrum.

The application of the forceps, moreover, is most commonly required after the head is low down in the pelvis, and rotation forwards of the occiput beneath the arch of the pubis has taken place. Hence the propriety of first describing the introduction of this instrument at this common stage of all positions where its application is most demanded, and of afterwards briefly alluding to the variations of the different positions when anterior rotation has not occurred. If the short forceps, either straight or double curved, should be fancied by the operator, there is no objection to it under the circumstances, but as the double-curved long forceps may be used here, as well as in the high operations, which are inapplicable to the short instrument, we shall describe the method of using only the double-curved long instrument. The patient being in the dorsal obstetric position, and all the preliminaries in

regard to the bladder, rectum, warming and anointing the forceps being attended to as before described, the medical attendant reassures himself as to the exact position of the fœtus, for it is possible for the latter to have changed its situation since the previous examination, and if the membranes be not broken, ruptures them. He then takes a seat in front and holds the left-hand or male branch of the forceps lightly in his left hand, either like a

FIG. 111.



Application of the Forceps at the Inferior Strait.

writing-pen, as shown in Fig. 111, or dinner-knife, in an oblique direction, with its handle elevated over the right groin, and the extremity of its blade parallel to the long diameter of the vulva. He next introduces two fingers of his right hand into the vagina as high as possible, so as to receive the convexity of the blade upon their palmar surface, while its concavity rests against the

surface of the fœtal head—the fingers being between the side of the head and the left side of the pelvis. They thus act as a guide and support to the blade of the forceps as it glides around the convexity of the head into position, and prevents its passing outside instead of inside of the cervix uteri, in the rare event of the latter not being fully retracted. Of course the convexity of the pelvic curve of the forceps looks towards the sacrum. No force is necessary in the introduction of the blade of the forceps, as, if properly applied, its concave side will glide around the convexity of the head into the pelvis by merely bringing the handle obliquely downwards and towards the median line of the perineum. Any difficulty arising in its introduction may generally be overcome by slight manipulations with the guiding fingers, or partial withdrawals and readjustings of the blade, but sometimes it becomes necessary to withdraw the blade entirely and reintroduce it. When the blade is *in situ*, its handle should be pressed back against the perineum and held in place by an assistant, while the second is introduced. The other, or right-hand branch of the instrument, is next taken in the right hand, and held in an oblique position over the mother's right groin, while the two fingers of the left hand should be inserted into the vagina, so that the blade of the instrument may be guided as the handle is lowered and brought toward the median line between their palmar surface and the head, and its concave surface glides around, and in contact with, the convexity of the fœtal head until the latter is properly embraced, when the two branches must be joined or locked. The blades of the forceps will now be found to be applied to the sides of the pelvis, and the sides of the head in the direction of its occipito-mental diameter, while the handles project in the axis of the inferior strait.

When the blades are properly introduced there can be no difficulty in locking them. If this cannot be easily effected, one or both blades must be readjusted if it can be easily effected by manipulation with the fingers inserted into the vagina, but no force should be used. If their false position cannot thus be readily and easily corrected, one or both blades must be entirely withdrawn and reintroduced.

Traction.—The introduction of the forceps must be made in the absence of pains; but traction should be conducted during the pains when there are any, and when there is none at intervals corresponding to natural labor-pains. Before commencing traction

the operator should introduce his fingers, or whole hand if necessary, into the vagina, and ascertain by careful examination whether any of the tissues of the mother are entangled within the grasp of the forceps. When everything is ready we begin our traction synchronously, when possible, with the uterine contractions, in a steady, careful manner, without making any more compression upon the handles than is necessary to cause the blades to firmly hold the fœtal head. The nature of the case may sometimes require more hurried and even continuous traction in order to save the life of the child or mother. The compression ought to be relaxed in the intervals between the traction-efforts, or the life of the child might be in danger. The compression should not, however, be relaxed where the head is arrested by a narrow vagina and elastic pelvic floor, because the part might then recede during the relaxation. A few practitioners tie or wrap the handles together in such a manner as to keep up constant compression of the blades upon the head, in all forceps operations. When the head is low down in the pelvis and rotation has occurred, as in the case under description, traction should first be made in the axis of the inferior strait until there is considerable distension of the perineum, when it must be exerted in the line of the perineal axis. However, if the physician will not resist the direction given to the handles by the extension of the head, but simply keep up sufficient compression on them to communicate a firm and steady grasp of the blades, he will find the handles gradually rise up as the head is being expelled. If he elevates the handles too rapidly or too much he will injure the soft parts over the rami of the ischia by the anterior portion of the blades, and the perineum by their extremities.

The double lever power of the forceps may be brought into service when extraction is slow and difficult by slightly swaying the handles from right to left. As the child is thus gradually pressing more and more upon the floor of the pelvis and distending the perineum, the latter should be supported by an assistant, or by one hand of the operator himself. Many practitioners very properly follow the advice of Dr. Meigs in reference to passing the middle finger over the lock, knee, or some other projecting part of the instrument to make the traction, while the tip of the forefinger is allowed to rest against the head in order to ascertain whether the forceps be slipping or not. It is the custom of some

physicians to unlock and remove the forceps, a branch at a time, just before the head emerges from the vulva, but the general rule is to leave it on until the head is expelled. Very little if any traction ought to be made at the time the head is nearly through the vulva, as nature is generally equal to the emergency. Of course the instrument must be removed on the birth of the head, as the body will soon follow. If it does not, strong pressure should be made upon the abdomen in the direction of the parturient canal, and if necessary a finger be inserted in the axilla and traction made, in order to supplement the natural expulsive efforts of the womb and accessory muscles.

Application of the Forceps, First Position, when the Head is in the Cavity of the Pelvis, prior to Rotation.—In the case just described as common to all the positions of the head at a certain stage of labor, the blades were directed to be applied to the sides of the child's head. I have elsewhere stated that it is recommended by Barnes, Playfair, and the majority of German accoucheurs to introduce the blades solely in reference to the sides of the pelvis for all positions of the fœtal head at any stage, whether rotation has occurred or not. Doctors Elwood Wilson, William Goodell, A. H. Smith, and other prominent American practitioners, prefer the introduction of the blades in reference to the sides of the child's head in all positions at the brim, in the cavity or outlet of the pelvis. The late Professors Hodge, of Philadelphia, and Elliot, of New York, also recommended this method, except in transverse positions of the head at or below the brim. While, for reasons given further on, I prefer the application of the blades of the forceps at or above the brim in reference to the sides of the pelvis, I would introduce them in regard to the sides of the fœtal head in the cavity and outlet of the pelvis, and therefore when the head occupies one oblique diameter, would introduce the blades in the other. Hence when the head lies in the right oblique diameter, as in the example under consideration, the instrument should be applied in the left oblique. As elsewhere stated, however, I do not follow the authority of Hodge and other American authorities in naming the diameters, but like Leishman, Playfair, and others, denominate them after the side of the pelvis from which the oblique diameter starts posteriorly. All of the preliminaries in regard to position of the patient, the emptying of the bladder and rectum, warming and

anointing the blades of the instrument, and passing the left-hand blade into the vulva, etc., being accomplished as before directed, we must, after the blade has fully entered, place it with its convexity opposite the left sacro-iliac junction. In order to bring the blade in place, it will be found necessary to depress the handle much more backward against the perineum than in the case previously described, when it should be given to an assistant. The right-hand or female blade should be introduced opposite the first. It may be passed into the vagina opposite the right cotyloid cavity or a little in front of it, but generally the firm pressure of the right parietal protuberance against the right ramus of the ischium or pubis renders its introduction at this point very difficult and often impossible. The difficulty may often be overcome by pressing the head upwards in the interval between pains; but in order to avoid it, it is preferable as a rule to introduce the second blade with its convexity looking towards a point just anterior to the right sacro-iliac synchondrosis, and after its introduction, to change its position by gradual pressure forwards towards the cotyloid cavity, until it gets opposite the first blade and is easily locked. The blades will now occupy an oblique position in the pelvis, or in other words occupy the left oblique diameter of the pelvis with its lock pointing towards the left groin of the mother. Prior to beginning traction we must examine by the touch whether the blades are properly adapted to the sides of the fœtal head, and whether any of the maternal tissues are within their grasp. At first the line of traction must be towards the coccyx, but after the perineum is somewhat distended the forceps, if forward rotation of the occiput does not spontaneously occur, must assist this forward movement. In this movement the first blade introduced will glide forwards, and the second one backwards, to the sides of the pelvis. This anterior rotation of the occiput should be completed by the time the perineum is one-third distended, when the handles will be observed to rise upwards in proportion to the extension of the head, and delivery is completed as described under the head of application of the forceps after rotation has occurred.

Application of the Forceps, Second Position, Head in Cavity of the Pelvis, before Rotation.—In this position the occiput looks towards the right foramen ovale, the forehead towards the left sacro-iliac synchondrosis, and the occipito-frontal diameter of the head lies in the left oblique diameter of the pelvis, conse-

quently the forceps must be introduced in the right oblique diameter of the pelvis.

The introduction of the forceps is very similar to the operation in the first position just described, except that the left-hand blade is carried more anteriorly, so that its convexity lies against the cotyloid cavity, while the right-hand blade is inserted along the right sacro-iliac synchondrosis, and is when the forceps is locked situated more posteriorly than the other blade. The lock of the instrument looks towards the right groin of the mother, instead of the left groin, as in the first position. Delivery is effected precisely in the same manner as in the first position except that rotation of the occiput is allowed, or encouraged to take place in an opposite direction, in order to allow the latter to reach the symphysis pubis. In other words, the occiput moves from right to left on the right anterior inclined plane to the arch of the symphysis pubis. It is well to bear in mind that although the left-hand blade when introduced lies on the left side of the head toward the anterior and left of the pelvis, yet we cannot always pass it into position in the most direct way because of the want of space between the left parietal protuberance and the ramus of the pubis, and that difficulty must be surmounted in a similar manner to the one arising in the application of the right-hand blade in the first position, by introducing the blade in the direction of the left sacro-iliac synchondrosis and then pressing it gently upwards into its proper position.

Application of Forceps, Third Position, Head in Cavity of the Pelvis, prior to Rotation.—In this position the occiput points towards the right sacro-iliac synchondrosis, the forehead towards the left foramen ovale, the occipito-frontal diameter of the head lies in the right oblique diameter of the pelvis, the same as in the first position only the poles are reversed, and therefore the forceps ought to be applied to the sides of the head so as to lie in the left oblique diameter of the pelvis. The method of introduction is precisely the same as in the first position of the unrotated head in the cavity of the pelvis.

After the instrument is properly adapted to the sides of the head and locked, we must before proceeding further bear in mind the mechanism of labor after this stage of the third position. The natural tendency of the occiput is to rotate anteriorly on the right side of the pelvis beneath the symphysis pubis, and for the

forehead to take the reverse movement on the left side of the pelvis into the hollow of the sacrum.

This movement will, as the head descends and expands the perineum, generally take place spontaneously if allowed to do so by the operator. In some cases he may encourage this rotation, but never oppose it. When it is accomplished, the delivery of the child is effected as first described for all anterior rotated heads. This and a similar rotation in the fourth position might perhaps require the use of the straight instead of the double-curved forceps, unless the instrument is withdrawn when the convexity of the pelvic curve of the blades commences to turn forwards, instead of remaining backwards, and is reintroduced with the concavity forwards. For it must be borne in mind that the rotation is so great that when complete the blades change places, the one that was introduced in the left side of the pelvis with its marginal concavity upwards opposite the sacro iliac junction, being transferred to a point opposite the right sacro-iliac synchondrosis with its marginal convexity upwards; and the blade which was introduced into the right side of the pelvis opposite the right foramen ovale with its concavity upwards, moves over to the left foramen ovale with its convexity upwards.

The time for withdrawing and reintroducing the blades is when the rotation has half finished its course, the left-hand blade having reached the hollow of the sacrum and the right-hand blade the symphysis pubis. If the second or pelvic curve of the long forceps is not very great there is no necessity for this withdrawal and readjustment of the instrument.

Application of the Forceps, Fourth Position, Head in the Cavity of the Pelvis, prior to Rotation.—The occipito-frontal, or long diameter of the head in this position lies in the left oblique diameter of the pelvis, the same as in the second position, but the poles are reversed as the occiput points towards the left sacro-iliac synchondrosis instead of the right foramen ovale, as in the second position. The forceps must be introduced in the right oblique diameter of the pelvis, just as in the second position; the mechanism of labor being the same in the fourth as in the second position, except that the rotation of the occiput beneath the symphysis pubis must be reversed, that is, the occiput must move forward on the left side of the pelvis instead of anteriorly on the

right side. The method of delivery with this difference in rotation is also precisely similar.

Application of the Forceps in the Third and Fourth Positions with Rotation of the Occiput into the Hollow of the Sacrum.—The blades of the forceps when introduced in a sacral rotation of the head, will correspond not only to the sides of the child's head but to the sides of the pelvis. As in all other cases the blades must be introduced with their marginal concavities upwards. In all these occipito-sacral rotations the blades of the forceps must, in order to be applied to the occipito-mental diameter, be firmly pressed against the perineum. In primiparæ it may sometimes be impossible, without injury to the perineum, to carry the blades sufficiently far back for them to correspond to this diameter, but they will extend from the occiput towards the angles of the jaw. If, however, their fenestra embrace the parietal protuberances there is no danger of the instrument slipping, provided pretty firm compression be exercised.

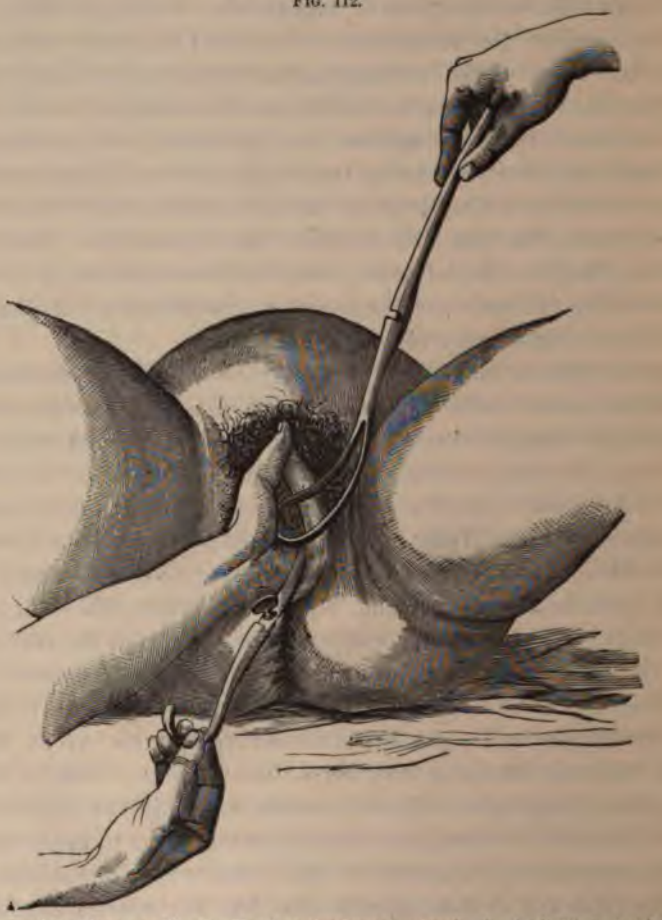
Application of the Forceps at the Brim in all Positions of the Head.—As it is often not only difficult to make an accurate diagnosis of the position of the head when at or above the superior strait, but also difficult to apply the forceps to the sides of the child's head, it is the custom of the great majority of practitioners, in which I fully concur, to apply the blades in reference to the sides of the pelvis and not the head, or else to apply them where there is the most room. Another reason for this rule of practice is, that the cases most commonly calling for forceps delivery at and above the brim arise from a moderate degree of contraction of the conjugate diameter of the latter, and that the head consequently is generally forced to assume, or at least to retain, more or less of a transverse, instead of an oblique position at the superior strait. Hence in order to apply the blades to the sides of the child's head, we would be compelled to apply them in the antero-posterior diameter of the brim, where there is not only the least room for their application, but the most danger of injuring the soft parts of the mother, especially the bladder in front and the tissues over the promontory of the sacrum behind.

The introduction of the blades in these high operations is much more difficult than in the cases previously described, owing to the distance they must pass in reaching the head, and sometimes to the mobility of the latter itself. When the application is at-

tempted before the head has entered and become somewhat fixed in the brim of the pelvis, it must be steadied by pressure through the abdomen.

Whatever difference of opinion there may be in regard to the use of the short and the long forceps after the head has passed

FIG. 112.



Application of the Forceps with the Head at the Superior Strait, the Left Blade held in place by an Assistant.

into the cavity of the pelvis, there ought to be none as to the use of the long double-curved instrument at and above the superior strait. The position of the patient and all the preliminaries of forceps operations are the same in these high applications as in the

lower ones. Instead however of inserting only two fingers into the vagina it may sometimes become necessary to introduce most or all of the hand in order to guide the blades into the os uteri if the cervix be not retracted out of reach, and to protect the parts from injury. The left-hand blade should be passed up along the left side of the pelvis, or the plane of the left ischium, between the fingers of the right hand and the head until its concavity is well adapted to the head of the fœtus. The handle should then be pressed back against the perineum and given to an assistant, as may be seen in Fig. 112. In like manner the other blade must be passed along the right side of the pelvis—the two fingers of the left hand, or the entire hand itself, being inserted as a guard and guide—until it gets alongside of the head opposite to the first blade, when the instrument must be locked, and intermittent traction begun synchronously with present, or in imitation of absent pains. This at first must be in the direction of the axis of the superior strait, gradually changing to that of the inferior strait, and then of the perineum. As the head descends through the cavity of the pelvis we must bear in mind the mechanism of labor, and be ready to aid nature in her efforts of rotating the occiput forwards beneath the arch of the pubes. If the position of the presentation could not be fully determined at the time the forceps were applied it can readily be done during the progress of the head through the parturient canal, so that intelligent exertions may be made to rotate in the right direction. If the operator is not in undue haste he can generally correctly interpret the spontaneous efforts at rotation by the head itself.

Of course, as in other forceps operations, a moderate degree of compression and a slight swaying motion are allowable. As the head is passing through the perineum the handles of the forceps must be gradually elevated in front of the symphysis and abdomen. Great care must be taken not to move them too rapidly or too far in this direction, or the rami of the pubes will be injured by the anterior edges of the blades, while the ends of the latter may plough up the perineum. When the forceps is introduced, as is here directed as a general rule in the brim operations, in reference to the sides of the pelvis, it is contended by many authors that the blades correspond to the antero-posterior diameter of the head. But, although the latter commonly lies in or near the transverse diameter of the pelvis, the tendency of the

blades to assume the oblique diameter of the pelvis when introduced is admitted by Simpson, Leishman, and a large number of late authorities. In consequence of this tendency the head is grasped by one blade being behind the ear, and the other over the frontal protuberance of the opposite side. This fact should not be lost sight of in our efforts at extraction and rotation. When the head is born we should follow the directions already given in reference to the birth of the body.

Application of the Forceps to the After-coming Head in Pelvic Presentations and After Turning.—As already stated, the emergency calling for extraction of the after-coming head by the forceps, in any variety of pelvic presentations or after turning, is generally so urgent that unless the practitioner has his instrument with him, the loss of the child by asphyxia is inevitable. Although the cases where the extraction by proper manual manipulation is unsuccessful are rare, the mere fact of their occasional occurrence ought to be a sufficient reason for the accoucheur to be prepared by having his forceps always with him.

In the extraction of the after-coming head, if the occiput be forward, as is commonly the case, the forceps should be applied to the sides of the head from the chin to the occiput, the child being elevated by an assistant during the operation, so that the handles shall be below it, and have a chance to be gradually raised during the extraction. When the occiput is resting behind in the hollow of the sacrum, the operation is more difficult, unless in those exceedingly rare instances where the head becomes extended, or the chin hooked behind and above the symphysis pubis. The natural mechanism of labor, under these circumstances, is for the chin and anterior part of the head to be born first, and the occiput to glide over the perineum afterwards. Hence, the forceps may be held in front of the child, and the blades introduced along the sides of the head, and, as traction is made, the handles of the forceps should be carried backwards; the assistant, at the same time, carrying the body of the child backwards, so that the face will glide under the arch of the pubis, and pass out at the superior commissure before the occiput sweeps over the posterior commissure of the vulva.

In those cases where the head is extended, or the chin is hooked behind and above the symphysis pubis, the application of the blades must be made behind the child, from the occipital protu-

berance to the chin, and the occiput delivered before the chin. In this case the handles of the forceps must be elevated during the traction, and the body of the child carried forwards at the same time, as in the occipito-anterior cases of the after-coming head. In fact, this plan is recommended, by some authorities, in all instances when the occiput lies behind, in these after-coming-head cases.

Application of the Forceps in Face Presentations.—It has already been stated that the forceps may be found useful in face presentations, when anything arises to require interference, such as impaction or exhaustion; but in this presentation it ought never to be applied when the face is above the brim, or sufficiently high up for podalic version.

As a rule, when the face has descended into the cavity of the pelvis, anterior rotation of the chin takes place, and labor, though prolonged, generally occurs without assistance; but, when the forceps is needed after rotation has nearly or entirely taken place, the blades can generally be applied to the sides of the face, either in the oblique or transverse diameter of the pelvis, without much difficulty. In extracting, when the chin arrives beneath the arch of the pubis, the occiput must be elevated over the perineum. As a general rule, the forceps ought not to be applied when the face is transverse in the pelvis, or still looking towards the hollow of the sacrum; and, if applied at all under these circumstances, should be used only for the purpose of rotation, after safer means have been tried in vain. But unless rotation of the chin forwards can be easily accomplished, especially if, for the mother's sake, rapid delivery is necessary, perforation of the head and extraction by the cephalotribe, or craniotomy forceps, are required.

Danger to Mother and Child in the Use of the Forceps.—The older writers, and some of the present day, bring forward a formidable array of injuries resulting from the application of the forceps. But when these cases are properly investigated, it is found that most of them, instead of being produced by the forceps, were the result of too long-continued pressure of the head upon the soft parts, causing inflammation and subsequent sloughing; all of which might have been avoided by a timely and judicious application of this instrument. That the forceps is capable of great injury to both mother and child when improperly used, is no reason why it should be discarded, but rather that the necessity for,

and proper mode of, its application should be more carefully studied.

Breech Forceps.—The use of the forceps has almost exclusively been confined to the fœtal head, although there has, every now and then, been some one who advocated its usefulness in pelvic presentations, when applied to the breech.

Professor A. J. Miles, of Cincinnati, Ohio, has lately invented a pair of forceps especially adapted to breech presentations. It is essentially the same as the cranial forceps, but is made to properly fit and grasp the pelvis, as the cranial forceps is constructed for head cases.

This instrument, shown in Fig. 113, "is twelve and one-half inches long; length of blades seven and one-half inches; length of the handles five inches; width of blades, in widest part, one

Fig. 113.

Miles's Breech Forceps.

and three-fourths inches; length of fenestrum two and five-eighths inches; width of fenestrum, in its widest part, one and one-fourth inches; distance of the blades, at the widest part, when locked, two and one-eighth inches; distance of the tips of the blades, when locked, one and one-fourth inches; length of the expanded part of the blades, four and one-half inches."

It has often been suggested that forceps might be so constructed as to be advantageously used in pelvic presentations, when the breech has been arrested, either by a disproportion between the head and pelvis, or from inertia. But, with the exception of Professor Heuter, of Marburg, and others, the experience of physicians has heretofore caused them to look upon the forceps as essentially a cranial instrument, and in no way adapted for other presentations than those of the head, including the face, of course.

CHAPTER XXXII.

THE FILLET—VECTIS—BLUNT HOOK—CROTCHET.

THE FILLET.—This most ancient of all instruments for extracting the child is very rarely used in modern practice. Until the invention of the forceps it was employed in all forms of cranial positions, as well as in other presentations. Although it is almost obsolete, it may still be sometimes of slight service in arrest of the breech by a disproportion of the head and pelvis, or from uterine inertia, by being passed over the flexure of the thigh—preferably of the anterior one, but even here it is commonly less efficient than the fingers.

In its most simple form it is only a loop or noose, made of a strip of any kind of cloth or leather, although lately it has assumed a more artistic appearance in the form of the "whalebone fillet." The best fillet is a hank of cotton-yarn, which may be conducted around the groin by means of a copper-wire bent at one end, so as to form a small opening or eye, through which a narrow braid or tape may be threaded and tied to the loop of cotton yarn, after the bent end of the wire has been pushed around the flexure of the thigh. By then withdrawing the wire, the hank of cotton yarn is made to encircle the groin. If desirable, one end of the hank may then be passed through the other, so as to form a loop. Great care should be taken to leave no projecting points to the bent end of the wire to obstruct its passage, or lacerate the flesh, and to have the wire just thick enough to be passed around, and yet not too thick to yield a little to the uneven surface over which it has to be pushed.

VECTIS.—The vectis or lever, invented by Roonhuysen, and introduced into practice in Holland shortly after the discovery of the forceps by Chamberlen, and like the instrument of the latter kept a secret for awhile, became at one time very popular, especially in London. The lever of Roonhuysen consisted of a flat strip of iron bent into a moderate curve at both extremities and covered with leather. The modern vectis is shaped very much like a si de of the straight forceps, having a handle and a fenes-

trated blade (Fig. 114). It acts both as a lever and tractor,—the power of traction depending very much on the curvature. In using it as a lever, a fulcrum must be made, not of the soft parts of the patient, but the hand of the accoucheur. Its leverage power is capable of great abuse, and should be exercised very cautiously. Like the fillet, the vectis is almost obsolete, having been displaced by the forceps. It is at present chiefly used to correct mal-positions, especially in occipito-posterior positions of the head.

Although, as a rule, I much prefer the forceps for delivery in posterior rotations of the occiput, as well as in all other positions, yet I have found the vectis very useful in some of these cases, one of which I shall relate. While in the medical department of the United States army, I was called to see a lady in the vicinity of the fort where I was stationed, who had been in labor for about sixty hours. The head of the child was found on the perineum, which was moderately distended; the occiput was resting in the hollow of the sacrum; the pains, which had been violent, were feeble and ineffective; the patient was in a state of great exhaustion; a cystocele, about the size of a hen's egg, protruded beneath the arch of the pubis; the bladder was enormously distended. I drew off the urine with a gum-elastic male catheter, compressed the contents of the cyst into the bladder, and applying a vectis to the occiput, with gentle leverage (using my left hand as a fulcrum) and traction, succeeded in a few minutes in drawing or lifting the occiput over the posterior commissure of the vulva, and in delivering the head, when labor was soon happily terminated. Both child and mother got along well.

Blunt Hook.—This, like the fillet, is an ancient instrument, formerly much used for extracting the fœtus, chiefly by being inserted into the flexures of the thighs, the axilla, etc., but the danger arising from its application of wounding the soft parts of the child has caused it to be discarded in all cases where the fœtus is living.

It is, nevertheless, a very useful instrument for extracting the latter when dead, and will be mentioned again under the head of embryotomy or embryulcia.

The Crotchet.—This instrument differs from the blunt hook in having its hook-like extremity sharpened and smaller. It is never used in the living child, but finds its chief employment in

craniotomy and embryulcia. The object of having its hook sharp is to enable it to be fixed in firm, bony parts like the cranium, orbit, mouth, foramen magnum, pelvic brim, or the spinal column. It is a dangerous instrument when it slips, and its hook should

FIG. 114.

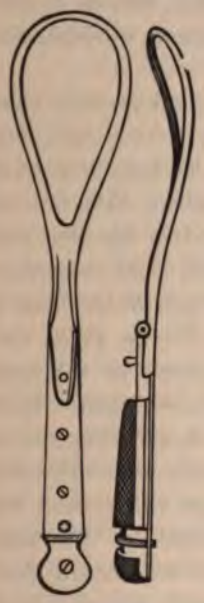


FIG. 115.

Guarded Blunt Hook and Crotchet.

be carefully guarded by a spoon-shaped blade that is attached to some of the instruments, or by the fingers of the operator. The crotchet was in use in the time of Hippocrates, and probably earlier.

The blunt hook and crotchet may be made into separate instruments, but it is more convenient to have them combined and guarded, as in Fig. 115.

CHAPTER XXXIII.

MANAGEMENT OF LABOR IN TWIN PREGNANCY—LOCKED TWINS—DECAPITATION.

Twin pregnancy has already been discussed in its general bearings under the head of plural pregnancy, but it is necessary to make a few remarks upon the management of labor in a case of twins.

A twin pregnancy is by no means incompatible with normal labor, yet is commonly more protracted. Although the presence of twins may sometimes be diagnosed by a careful examination, especially auscultation, during pregnancy, this for many and obvious reasons is hardly ever undertaken by the practitioner, and consequently the presence of a second child is rarely suspected until the birth of the first, when the nature of the case is so plain that one can hardly believe it possible for an error to be made. Yet mistakes have occurred. A physician of my acquaintance once sent his pupil to attend a lady in confinement. In due course of time the young man returned with a glowing account of his first successful labor case. He had scarcely concluded his remarks upon the subject, when a hasty messenger announced the birth of the second child shortly after the departure of the young doctor, and the startling fact that the mother was dying from hemorrhage of the womb. The preceptor upon his arrival found the patient dead. The fact of the womb remaining nearly as large after the birth of one child as previously is generally sufficient of itself to render it almost certain that there is a second fœtus. Yet without a little care a mistake is possible, especially when the uterus becomes enlarged from internal hemorrhage, or pregnancy has been complicated with the presence of external uterine, or abdominal, tumors. The placenta not coming down after sufficient pain is further evidence of another child; but the most complete of all is the presence of a bag of waters, and finally of the presenting part of the fœtus itself at the mouth of the womb. These signs, and others to be gained by conjoined manipulation, soon enable the diagnosis to be made beyond the shadow of a

doubt. But it does not follow that we should at once announce the fact to the mother. This is a matter of expediency, and must be managed according to circumstances. If we know that she desires twins, the news may be told to her earlier, than if she *fears she is going to have two babies.*

The most frequent presentation in twin pregnancy is with both heads, the largest descending first; the next most frequent is the head of one fœtus and the breech of the other; the third, with the feet of both. In some cases there may be a cephalic, or pelvic presentation of one child and a shoulder presentation of the other.

Expulsion of the Second Child in Twin Labor.—After the birth of the first child there is a temporary interval of rest, usually not exceeding ten or twenty minutes, when the pains recur, and the second child is readily and quickly expelled, because the soft parts are fully dilated. Not unfrequently, however, some hours elapse, and occasionally several days before the birth of the second child. The management of twin cases differs in no essential point from ordinary or single labor. As a rule we must trust chiefly to the natural efforts, and only interfere when some unusual condition arises.

In the event of an unusual delay in the recurrence of the pains, abdominal pressure and titillation of the os uteri may be found serviceable in exciting uterine action. If labor pains fail to come on within a few hours, ergot should be administered and the membranes ruptured. Playfair thinks it best to rupture the bag of waters of the second child shortly after the birth of the first as the speediest way of inducing uterine contractions.

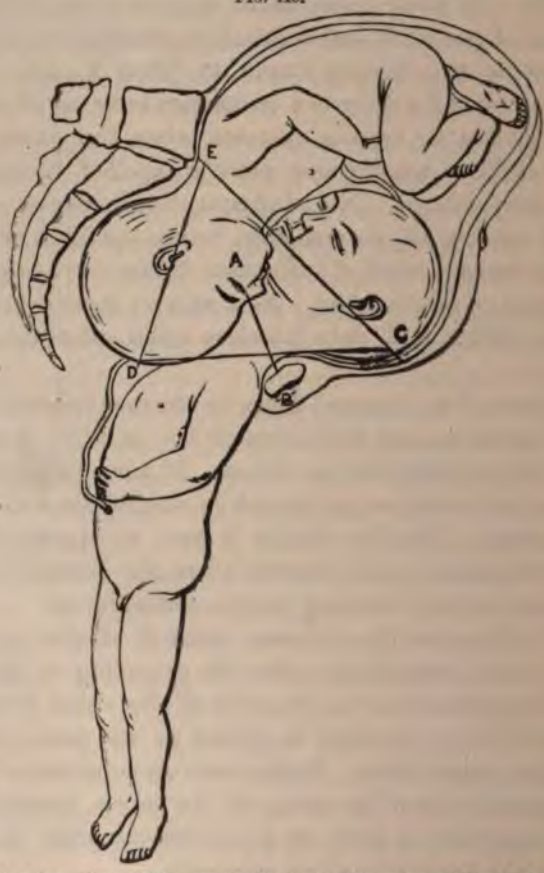
Murphy advocates the extreme method of always delivering the second child immediately after the expulsion of the first. If any necessity arise either on the part of the child or mother for immediate delivery, we must be guided by the same principles of action as in a single labor. Under these circumstances if the head has not descended into the cavity of the pelvis, turning would be indicated, especially if there be a mal-presentation; if it has, extraction by the forceps becomes necessary.

Locked Twins.—This is one of the most serious difficulties that can occur in twin pregnancy. It may take place either when both heads present, or the head of one and the pelvic extremity of the other. It has been stated in the chapter on multiple or plural pregnancy, that instead of both fœtuses having separate bags of

water, they are sometimes included in a common amniotic sac. It is the latter condition that is most apt to give rise to locked twins, but this difficulty is also likely to occur when there are two bags of membranes, if rupture of both occurs simultaneously.

Locking in Presentation of the Head of One and the Breech of the Other.—The most common variety of locking takes place in a presentation of the head of one child, and the pelvis of the

Fig. 116.



Shows Head Locking, First child coming feet first; Impaction of Heads from Wedging in Brim (after Barnes). D. Apex. E. C. Base of Wedge which cannot enter brim. A, B. Line of Decapitations to decompose wedge and enable head of second child to pass.

other. In such a case labor progresses well until the body of the latter is delivered, when a delay in the expulsion of its head leads to the discovery that it is locked with that of a second child

which has descended into the cavity of the pelvis, thus rendering natural labor impossible unless the pelvis be exceedingly large or the twins very small. This difficulty has been well illustrated by Barnes in Fig. 116.

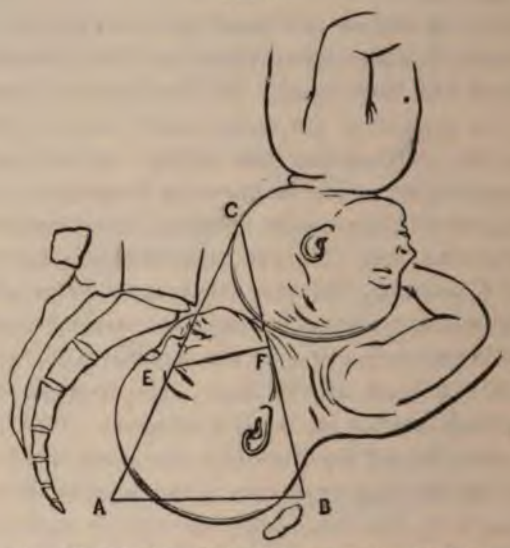
TREATMENT.—If the second head has not descended too low in the pelvic cavity it may be possible to push it above the brim, out of the way of the first head. If this prove unsuccessful the forceps may be applied to the second head and an effort made to draw it past the body of the first child. In the event of failure in these more simple modes it becomes necessary to destroy one of the twins, and as the pressure upon the umbilical cord generally proves fatal to the first child, decapitation of after-coming head of the latter is probably the best thing to be done, when its body will pass without any difficulty whatever, and its head will recede so as to permit the extraction of the second child by the forceps, and finally of the head of the first. The method of decollation will be described further on in this chapter. The trouble in removing the decapitated head renders this mode of managing these cases more difficult than to perforate the head of the second child and to deliver it by the craniotomy forceps or cephalotribe. The latter operation however is unjustifiable unless the fœtus be dead, otherwise both children would probably be born dead, because the first as already stated can hardly ever stand the prolonged pressure upon the cord to which it is usually subjected.

LOCKING IN PRESENTATION OF BOTH HEADS.—In this case the head of one child passes without difficulty into the pelvic cavity, but its thorax comes to the brim with the head of the second child, as shown in Barnes's Fig. 117, thus rendering the further progress of either impossible unless something is done to disengage them one from the other.

MANAGEMENT.—We should endeavor to push out of the way the second head by conjoined manipulation, while the first is delivered by the forceps. If this plan fail, as it often will, we may next endeavor by appropriate manipulation to push up the first, and down the second head, and deliver by the forceps. In the event of non-success by these efforts, it becomes necessary to lessen the size of the second head by perforation, removing the brains, and crushing the cranium by a cephalotribe, or removing it piecemeal with the craniotomy forceps, so as to enable us to deliver the first child by the forceps, when the second may finally be extracted.

It would be useless to reverse the operation by perforating the first coming head before the second, as delivery could not be accomplished in this manner.

FIG. 117.



Shows Head Locking, both children presenting head first.

DECAPITATION.—This revolting operation, which is one of the legacies of antiquity, is not only a *dernier ressort* in cases of locked twins as just described, but sometimes in cross or shoulder presentations where turning has been found impossible. As the name implies, it consists in severing the head from the body of the child. When the operation is performed in cases of locked twins where the body has already been expelled, the head remains behind to be removed after the birth or extraction of the second child. In cross presentations it is extracted after the removal of the body—the latter operation being facilitated by traction upon the arm, which is usually protruding beyond the vulva.

METHODS OF DECAPITATION.—The neck may be severed by a pair of scissors, Ramsbotham's hook, Braun's decollator, a strong piece of whipcord, or the wire of an écraseur. Meadows prefers a pair of strong sharp-pointed scissors to any other instrument with which he pierces the neck and divides the spinal column. Dubois recommends a pair of strong blunt scissors, with which he divides the neck from below upward by a series of snipping movements.

Playfair believes there is nothing superior to the wire of an écraseur drawn tight by the latter instrument. In Great Britain the favorite instrument is Ramsbotham's hook, which resembles the blunt hook sharpened on the inner or concave edge. Using one hand as a guide this is introduced and adjusted over the neck, which is severed by a sawing motion. In using Braun's decollator, the motion must be rotary from right to left while traction is also made.

The whipcord, after being carried around the neck, may be worked through a speculum by cross handles attached to the two ends. The motion is from side to side, or somewhat rotary, and should be continued until the head is severed from the body. The woman should be in the dorsal obstetric position, her bladder and rectum must be emptied, and whatever instrument is used ought to be carefully guarded with one hand, while being introduced by the other. The neck of the child must also be brought as low down as possible during the operation. In cross presentations this may be effected by pulling upon the protruded arm, and in locked twins by making traction upon the expelled body of the fœtus.

Extraction of the Body and Head.—No difficulty can occur in extracting the body after the usual operation of decollation in twin pregnancy, and very little after that in cross presentations. In the latter it is sometimes necessary to pass a blunt hook or the finger into the axilla and make traction, while we are drawing upon the opposite arm. Traction upon the arm is however all that is usually required in order to liberate the trunk. After the withdrawal of the latter, the head can generally be pushed down into the pelvis by pressure upon the abdomen, where it may be seized and removed by the cephalotribe. As the brain can escape through the severed vertebral canal, it is generally unnecessary to perforate the cranium. If for any reason it becomes desirable to use the craniotomy forceps instead of the cephalotribe as an extractor, perforation must be made. The great mobility of the head is a serious obstacle to the latter operation. This difficulty may often be surmounted by an assistant pressing downwards and steadying the head through the hypogastric region. In the absence of the cephalotribe, the forceps might in simple cases be successful. In its application, and in that of the first-named

instrument as well as the perforator, the greatest difficulty consists in fixing the head. But, as before mentioned, this may be accomplished by the hands of an assistant. Sometimes the guarded crotchet or a small blunt hook may be of service in extraction after being fixed in the foramen magnum, the perforated skull, or the orbit, but the risk of its slipping and injuring the mother is so great as to deter most accoucheurs from its use when safer means are available.

CHAPTER XXXIV.

VERSION OR TURNING.

By turning, is meant the substitution of one presentation for another less favorable. There are two chief varieties, the podalic and the cephalic. By the first is understood the bringing down of the feet, and by the second, the bringing down of the head, to the os uteri or brim, as a substitute for some other part. Some authors make a third variety—the pelvic; but this is an unnecessary complexity.

Cephalic Version.—Although turning by the head, by the old plan of introducing the hand into the womb, is so little thought of since the introduction of the ordinary podalic version, that many writers, especially British, either condemn or ignore it, yet it was almost exclusively practised by the ancients from the time of Hippocrates to about the year 1561, when Pierre Franco suggested version by the feet. His suggestion was first carried into practice by the celebrated Ambroise Paré, followed by Guillemeau, Mauriceau, Baudelocque, Madame Lachapelle, and other distinguished accoucheurs, and soon became generally adopted, to the almost entire exclusion of the cephalic method. In course of time, however, the latter was again recognized as an operation that might be tried in a certain limited class of cases, prior to turning by the regular internal podalic method. Such, for example, as a shoulder, or transverse presentation, when diagnosed prior to the rupture of the membranes, and when there is no haste for the completion of labor. But in such cases version is, by modern accoucheurs, sought to be brought about either by the external, or the bi-polar method, instead of by the ancient mode of introducing the hand completely into the uterus. If it cannot be effected, then the hand is carried into the womb, and turning by the feet is accomplished.

The ancients practised turning by the head because they believed that it was the only natural way for the birth of the child. In fact, the most of them thought, like Hippocrates, that it was impossible for labor to terminate favorably by any other presen-

tation, and, consequently, whenever any other part presented, even the breech, they would turn by the head. It certainly is a safer operation for the child, and where delay is of no consequence, to the mother also. But the difficulty of its performance, at least by the old internal method, and its inefficiency when there is a necessity for rapid delivery, more than counterbalances this advantage.

Podalic Version.—The reasons why podalic version so rapidly displaced in public favor the ancient turning by the head, seem to be chiefly on account of its facility of performance, and rapidity in the termination of labor; for it is often very difficult to seize, bring down and properly adjust the round, slippery head, by the old method of introducing the hand into the womb. By the modern external and bi-polar modes, especially the latter, the difficulty and danger are so much less, that turning by the head in transverse presentations particularly, will become more popular. But where haste is necessary, in the latter presentation, as well as in all others adapted to turning, podalic version, and that too in the regular way of introducing the hand into the womb, must be resorted to.

In transverse presentations, when haste is not important, either podalic or cephalic version by the external or the bi-polar method may always, in favorable cases, such as unruptured membranes, etc., be tried before the more regular method of introducing the hand into the uterus and bringing down the feet, is resorted to.

Suitable Cases for Turning.—Version is required in transverse presentations, in many cases of convulsions, placenta prævia, accidental hemorrhage, prolapse of the umbilical cord, excessive vomiting, certain cases of death of the mother, moderate contraction of the conjugate diameter of the superior strait, or where it is not less than three inches, in rupture of the womb, where the fœtus is not expelled into the abdomen, etc.

In some of these cases, especially in the two latter, it often becomes a question whether the forceps ought not to be used in its stead. In the selection of the operation even, the experience and skill of the operator in the respective operations may be allowed some weight. Occasionally, too, the question of craniotomy, in moderate contraction of the conjugate of the brim, has to be considered with the other two operations. After the sudden death of the mother, turning, in consequence of its greater danger to

child than the Cæsarean operation, is rejected in favor of the
er, by most accoucheurs, because the operation then is solely in
interest of the child.

s version was, before the invention of the forceps, the only
wn mode of artificial delivery without sacrificing the fœtus,
turning by the feet the best method of version, the latter be-
e very popular, and was adopted in many unsuitable cases. It
after awhile, almost entirely superseded by the forceps, except
ransverse presentations. At the present day, however, al-
igh artificial delivery by the forceps is undergoing a second
od of popularity, greater than the first, it is recognized by the
ority of the profession that turning is not only indispensable
uitable cases of transverse presentations, but may often be
to advantage in the other emergencies just enumerated.

REQUENCY OF TURNING.—In 505,691 cases of labor in German,
ch, and English practice, there were, according to Churchill,
cases of turning, or about 1 in 122¼.

ORTALITY.—The same authority estimated the fœtal mortality
in 3, and the maternal at 1 in 4. The junior reader must
in mind the usual fallacy of statistics, which make no dis-
ination between deaths resulting from the operation itself,
those arising from the condition necessitating the operation,
e may form a false notion as to the danger of turning. I have
ed that there are two chief *varieties of turning*, the *podalic* and
alic.

here are also three methods of turning:

st. By external manipulation.

d. By combined external and internal manipulation, also called
bi-manual, or bi-polar operation.

d. By internal manipulation, or the regular podalic method.

lthough the possibility of version by external manipulation
been long known, we are mainly indebted to Wigand for its
ption by the profession as one of the proper methods of turn-
He, however, considered it applicable to transverse presen-
ons only. For the bi-polar method we must give credit to
er Dr. Braxton Hicks, of England, or Dr. M. B. Wright, of
cinnati, Ohio, both parties claiming the priority. It is, how-
, only a combination of the Wigand, with an internal method
gested by Dr. Robert Lee, though the latter believed his mode
applicable to transverse presentations, whereas Dr. Braxton

Hicks claims that his bi-polar method is not merely applicable to transverse presentations, where only a partial turning is necessary in order to bring down the head or the feet, but to cases of placenta prævia, and those of moderate contraction in the antero-posterior diameter of the superior strait, where immediate delivery is not demanded. The combined method of turning being attended by no risk either to the mother or the child, it can be followed when it fails by the regular internal podalic method.

Conditions Favorable for Version.—An unruptured bag of waters is one of the most favorable conditions that can possibly exist for all varieties and methods of turning, and is absolutely essential to version by external manipulation, and almost essential for that by the combined external and internal, or bi-polar method, although the latter may be performed immediately after the rupture, if other conditions are highly favorable

Dilatation of the os uteri is not necessary in the first-mentioned mode of turning; but is useful because it is often important to rupture the membranes as soon as turning is completed, so as to fix the newly presenting part in the pelvis, which cannot be readily done unless there be a moderate degree of dilatation of the os. A slight dilatation is essential for the internal manipulation of the bi-polar or bi-manual method, and also for fixing the presentation by rupturing the bag of waters after version. For turning by the regular internal method, it has generally been stated that the os uteri must be dilated at least to the size of an English crown. This is a mere approximation, for the dilatation may be less if the os is very dilatable, and should be more if otherwise. Of course, where an emergency exists for regular podalic version in an undilated and rigid os uteri, remedies for overcoming these unfavorable conditions should be used; such as the hydrate of chloral, chloroform, ether, vaginal and hip-baths, and, if the membranes have ruptured, Molesworth and Barnes's rubber dilators.

Bladder and Rectum.—To save repetition it may be stated that as a preliminary to all varieties and methods of version the bladder and rectum must be empty.

Position of the Patient.—The woman should be upon her back obliquely across the bed in external manipulation, and across the bed in the bi-polar and regular podalic methods. English physicians prefer the left side position. Her legs and thighs must be flexed.

Her feet should rest each upon a chair, except in the external method. Her shoulders ought to be slightly elevated.

As the diagnosis in cases available for version by external manipulation, has to be determined chiefly by palpation, the abdomen of the patient must be uncovered. This is almost equally necessary in the operation itself of turning by the external method. In the bi-polar method it is not generally required, and is never desirable in the operation of regular internal podalic version.

Turning by External Manipulation.—This is applicable only in transverse presentations, as a complete evolution of the child is not desired, but simply the bringing down to the brim, one of the polar extremities of its long diameter. Those who practise it, generally endeavor to bring down the head, mainly because in this presentation the child hardly ever lies directly across the pelvis, but occupies an oblique position with its head the lowest. The operation is more easily performed where the abdominal walls are thin and relaxed than where they are thick and rigid. It is only possible when, as has already been said, the fœtus is floating freely in the liquor amnii, and may be executed either before or at the commencement of labor. It should never be tried when rapid labor is necessary; but under other circumstances, when the conditions are favorable, it may be resorted to, and if not successful, there is no harm done to the patient, as either the combined or regular method may succeed it. But however popular the operation may become, it cannot be said that it is as yet very generally practised by the profession.

Operation.—The diagnosis having been accurately determined according to the method described in the chapter upon the diagnosis of presentations and positions, and all the preliminaries just described having been attended to, the operator places his hands upon the abdomen over the opposite poles of the fœtus, and if he desires to produce cephalic version, he pushes the head down towards the brim with one hand, while with the other he lifts up the breech. This is to be accomplished by a series of gentle gliding motions during the interval, or at least remission, of uterine contractions. If podalic version is desired the movements of the hands are reversed so as to lift up the head towards the fundus uteri by one, and press down the feet towards the os uteri with the other hand. If it be possible the head of the fœtus should be kept well flexed upon the sternum, and its back looking somewhat anteriorly. As

soon as the presenting part is brought to the brim and placed in a favorable position the bag of waters should be ruptured, and the presentation pressed well into the brim, otherwise it will renew its abnormal position, even in spite of assistance by compresses, pillows, and cushions from without. The labor may then be left to the natural efforts.

Operation by the Bi-polar Method.—Instead of manipulating with both hands externally, as in the method just described, one

Fig. 118.

hand, the right, should be placed upon the abdomen upon one of the poles of the long axis of the fœtus, in order to push it down on one side of the abdomen towards the os uteri, while one or two fingers of the left hand should be inserted in the os uteri against the presenting part, which should be pushed up on the opposite side of the pelvis and abdomen towards the fundus uteri. If the shoulder presents, for instance, and cephalic version is desirable,

the pressure by the finger or fingers of the internal hand must be against the shoulder in the direction of the breech of the child, while the external hand may be employed at first in pushing down the head, and subsequently in lifting up the breech towards the fundus of the uterus. If, on the contrary, we wish to produce podalic version, the movements of the hands must be reversed, so as to press downwards on one side of the abdomen the breech of the child with the external hand, and upwards on the other side of the abdomen the head by the fingers within the os uteri, as shown in Fig. 118. The internal force therefore must be directed towards the head, instead of the breech of the child, as before described, for cephalic version. When either cephalic or podalic version is thus effected the child must be supported for awhile in its new relations to the pelvis, until the presenting part can be so secured that it will not turn back again. This is sometimes very difficult to accomplish, but may be facilitated when the pains are good, by rupturing, if it has not already broken the bag of waters.

In this conjoined or bi-polar method of turning, the whole hand is never introduced into the cavity of the womb, but it may, if necessary, be carried within the vagina so as to enable the fingers to be inserted sufficiently far into the cervix or os uteri to be properly available in forcing away the mal-presentation, and in conducting into the right position the substituted presenting part. Of course the vaginal hand must be anointed and inserted into the vagina with the utmost care and gentleness. It may be necessary, if the parts are small, dry, rigid, and very sensitive, that an anæsthetic should be administered to the patient.

The Operation for Regular or Internal Podalic Version.—At the risk of tautology, I must again state that the operation now to be described is the one first practised, though not first suggested, by Ambroise Paré, and the one upon which the great majority of practitioners have ever since relied, and consists chiefly in the introduction of the hand, and a part of the forearm, within the uterine cavity, for the purpose of substituting a foot presentation for any other that it may be desirable to displace.

After the preliminaries as regards diagnosis, position, the emptying of the rectum and bladder have been attended to, the practitioner, seating himself near the breech of his patient, with his coat off, and arm bare, and having his hand and forearm well lubricated, with the exception of the palm, with lard, sweet oil, or cosmoline,

insinuates his hand, with the fingers placed in the form of a cone, gently within the vagina. When practicable he should choose that hand the palmar surface of which, when introduced, corresponds to the anterior aspect of the child. Consequently, when the latter lies in either the left occipito-anterior, as in Fig. 119, or left occipito-posterior position, the left hand must be selected, and when it occupies either the right occipito-anterior or the right occipito-posterior position, the right hand must be used. That is upon the supposition that the woman lies upon her back, and the practitioner is ambidextrous. So far as transverse presentations are concerned,

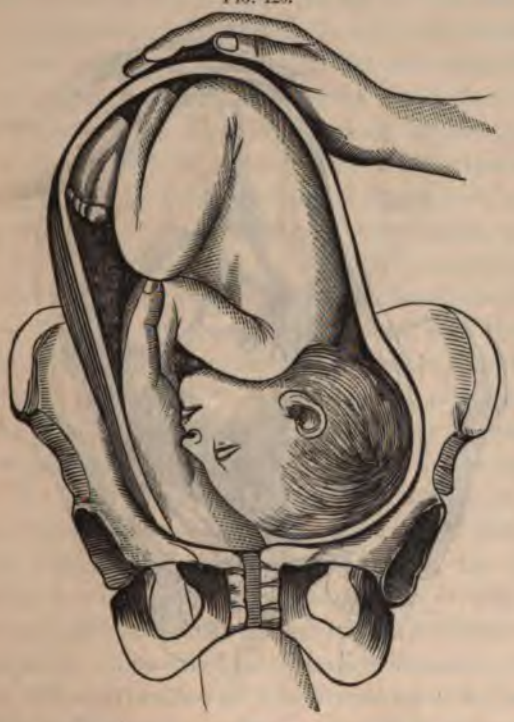
FIG. 119.

it would be more correct to direct the left hand to be introduced when the head is in the left iliac region, and the right when it is in the right iliac region.

If, however, the fœtal hand protrudes, its palm corresponding to the abdominal surface of the mother, is the best guide for the practitioner. If the physician cannot use equally well both hands, he may insert the one he is accustomed to employ, and bring its palmar surface as best he may in relation to the abdominal surface of the fœtus. The patient ought to be under the influence of an anæsthetic for the relief of pain and a proper relaxation of the

especially the womb. Chloroform is probably the best, h ether is preferred by many on account of its supposed er safety. The hand being introduced into the vagina, the step is gently to insert it into the os uteri. During this part operation the womb ought to be supported through the ab- n by the other hand (Fig. 120), or that of an assistant. There ually not much trouble in passing the hand into the cavity of terus if the os and cervix uteri be well dilated, or very dilat-

Fig. 120.



but its insertion may be very difficult or impossible if these able conditions are absent, at least until the obstacle is over- by artificial means. The fingers may be introduced in the of a cone; but when this is impracticable, first one, and then er finger should be inserted in the most cautious manner. If embranes be unbroken, the hand ought to be passed between and the uterine wall, and carried up very cautiously in the al, or at least remission of pains, until opposite the foot which

is to be seized. Whenever a pain comes on, the hand must be laid flat with palm against the child and kept quiet. Sometimes the mere presence of the hand in the womb, notwithstanding the patient is under the influence of an anæsthetic, stimulates almost continuous action in the womb, so that it is impossible to follow the direction of most authors to advance the hand or move it only during the interval of pains. Hence the description above allowed for the operator to move it even when there is no intermission, provided there is a remission, of uterine contraction.

FIG. 121.

Having carried the hand as far as desirable, but not high enough to endanger a separation of the placenta, the bag of waters must be ruptured, and one or both feet, as represented in Fig. 121, or one or both knees, laid hold of and brought down. There is a difference of opinion among authors as to whether it is better to bring down to the os uteri one leg or both legs. If both feet or knees can be conveniently reached they may be brought down, especially if a rapid delivery be very desirable, for the operator can thus have a better control of the labor, but when both limbs

cannot be easily seized, the foot or knee that is most accessible ought to be brought down without the delay and risk of searching for the other. There is in fact a positive advantage to the child in bringing down only one leg, because the remaining one helps to increase the diameter of its pelvis and thereby cause greater dilatation of the parturient canal, and a more rapid and easy passage of its head—thus lessening the danger of asphyxia of the child from pressure on the cord by the after-coming head. It was formerly supposed to be the better practice in transverse presentations to bring down to the os uteri the leg of the side opposite to the presenting shoulder. This plan is still advocated by Leishman and Barnes, and was by Playfair in the first edition of his system of midwifery, but the latter has since then changed his opinion, and concurs with Dr. Galabin and others, who advocate the seizing of the leg which is nearest to, and on the same side as, the presenting arm. If gently managed there will not be much trouble in passing the hand between the uterine wall and the membranes, yet when the latter are thin they may be prematurely ruptured. Some authorities direct that the hand should be carried up as high as the foot or knee, to be seized and brought down before attempting to rupture the bag of waters, but by following this advice there is danger of separating the placenta. It is the most prudent plan to introduce the hand only a few inches and then rupture the membranes by pushing the finger against them, after which the hand should be carried in search of the nearest foot or knee, which when found must be brought down to the os uteri. When the operation is thus conducted the liquor amnii does not escape immediately upon the rupture of the membranes, as might be supposed, because the arm until withdrawn acts as a plug to prevent it. The hand sometimes becomes so cramped and paralyzed by the contraction of the uterus as to be nearly powerless for action, and this too perhaps when it is almost in reach of the part to be brought down. Under these circumstances we must rest it for awhile, or stretch the fingers, when its strength may return. If it does not there is no alternative but its withdrawal and the introduction of the other hand, or the same one after its power has been restored.

In turning we must be careful not to mistake the knee for the elbow, or the hand for the foot. The first error may be avoided by remembering that the salient angle of the knee looks towards

the child's head, and that of the elbow towards its feet; and the second error by bearing in mind that the great toe cannot be brought into apposition with the others, as the thumb can with the fingers, and that the latter are not all on a line like the toes; and finally, that the hand is not articulated with the arm at right angles like the foot with the leg.

In drawing down the foot or feet, or knees, we must endeavor to so manage it that the dorsum of the child should look anteriorly. Still even if we fail in this, and none but gentle means should be used, nature, if not too much interfered with, will cause the proper anterior rotation of the occiput. The bringing of the back forwards, or abdomen backwards, is particularly desirable in cases of prolapse of the umbilical cord, as it is less liable to dangerous pressure when lying posteriorly. Sometimes after we have succeeded in conducting the foot or feet to the superior strait the head refuses to rise towards the fundus. What is to be done then? A running noose of tape or worsted should be placed around the foot brought down, and traction made upon it by one hand, while the other or at least a finger being inserted into the os uteri pushes to one side and upwards, the head, the loop being necessary because of the impossibility of using both hands in the vagina at the same time.

When version is complete or the new presenting part at the brim, the question arises as to whether labor should be completed at once by further assistance, or left to nature. If there be no urgent reason for immediate delivery, nature may be allowed a reasonable time to accomplish the act, but generally it is better to finish the delivery by judicious assistance. When aid is required it should be rendered in a similar manner to like conditions in pelvic presentations. We must depend a good deal upon abdominal pressure, a proper elevation or depression of the breech, when expelled, according to whether the occiput points anteriorly or posteriorly, or the chin is hooked against the symphysis, as pointed out in the chapter on Pelvic Presentation. We must also bear in mind the proper mechanism of labor in pelvic cases and the necessity of great caution in regard to traction, which should be made very cautiously only during pains. We should remember too the urgency for forceps delivery when the life of the child is endangered from pressure of the cord between the after-coming head and the pelvis. As soon as the breech is expelled and the

umbilical cord can be reached, a loop of it should be gently drawn down in the manner illustrated in Fig. 122. The cord should also be guided to one or the other sacro-iliac synchondrosis, in order to obviate as much as possible dangerous compression upon it while the thorax and head of the fœtus are being born.

FIG. 122.

VERSION AFTER THE ESCAPE OF THE LIQUOR AMNII.—Podalic version under favorable conditions, such as an unruptured bag of waters, and a well-dilated, or dilatable os uteri, the absence of impaction, etc., is not generally very difficult. But when the liquor amnii has escaped for some time, and the cavity of the womb has become dry, and the uterine walls have firmly and closely grasped the fœtus, which has, perhaps, been permitted to descend some distance into the pelvis, the operation becomes exceedingly difficult and sometimes impossible. The difficulty of

OPERATION IN PLACENTA PRÆVIA.—In a case of placenta prævia if the os uteri is only slightly dilated, and the flooding not very great, and yet turning is necessary, we may try the bi-polar method of podalic version first, because it only requires the introduction of one or two fingers into the cervix uteri. If this fail, artificial dilatation of the os uteri must be made by Molesworth or Barnes's, or some other fluid dilator, and regular internal podalic version executed. The hand should be passed on the side of the cervix where there is the least or no attachment of the placenta, and after being carried up a short distance between the uterine walls and membranes, the latter must be ruptured and turning effected as in other cases. After the lower extremities have been brought through the os uteri they frequently act as a plug in checking the hemorrhage, so that we have time to delay delivery for awhile, if so desired, in order to permit the patient to recover her strength.

turning under these circumstances is not only great, but the danger to the mother of rupture of the womb, or subsequent inflammation of this organ or the surrounding tissues, is very grave. The danger to the child is also increased in proportion to the difficulty of labor. To obviate these risks so far as regards the dryness of the mucous membrane, a quantity of tepid olive oil might be injected into the cavity of the uterus as a preliminary step to version. It can be accomplished by passing up a soft, flexible rubber tube attached to a pump syringe or rubber fountain containing the fluid, and allowing the latter to pass through it.

Turning in Transverse Presentations.—The difficulties in turning just mentioned, are very apt to come on in neglected cases of transverse or shoulder presentations. In some of these cases the liquor amnii has escaped, the shoulder has been pressed deep down into the cavity of the pelvis, or the arm has protruded, and in very rare instances there may be a complication of moderate contraction of the conjugate diameter of the brim. It is often impossible under these circumstances to effect turning, and decapitation and other instrumental means of delivery described in another chapter have to be resorted to.

Version in Contracted Brim.—When the antero-posterior diameter of the brim is less than three inches, it is impossible to deliver by turning even under otherwise favorable conditions. When the diameter is above this, but less than normal, the other conditions must generally be favorable or its performance is extremely uncertain. Under these circumstances if we cannot deliver by the forceps, or by turning, craniotomy, or some other form of embryotomy must be had recourse to. Dr. Simpson has succeeded in cases of contraction of the brim of not less than three inches in the conjugate diameter by podalic version after failure by the forceps. Others have done the same. Many practitioners always give preference to the high forceps operations in such cases in preference to turning—especially by the ordinary internal method.

Death of the Fœtus.—It does not necessarily follow because the child is dead that version may not be resorted to, for, under favorable conditions, it is often the easiest and quickest method of delivery. But in cases where, if the child were living, one might hesitate to resort to embryotomy on its account, we may decide in favor of its destruction when dead, for the reason that the interest of the mother alone is then under consideration.

OPERATION IN PLACENTA PRÆVIA.—In a case of placenta prævia if the os uteri is only slightly dilated, and the flooding not very great, and yet turning is necessary, we may try the bi-polar method of podalic version first, because it only requires the introduction of one or two fingers into the cervix uteri. If this fail, artificial dilatation of the os uteri must be made by Molesworth or Barnes's, or some other fluid dilator, and regular internal podalic version executed. The hand should be passed on the side of the cervix where there is the least or no attachment of the placenta, and after being carried up a short distance between the uterine walls and membranes, the latter must be ruptured and turning effected as in other cases. After the lower extremities have been brought through the os uteri they frequently act as a plug in checking the hemorrhage, so that we have time to delay delivery for awhile, if so desired, in order to permit the patient to recover her strength.

CHAPTER XXXV.

EMBRYOTOMY, INCLUDING CRANIOTOMY, CEPHALOTRIPSY, AND EVISCERATION.

EMBRYOTOMY implies a division of the fœtus into, and its extraction by, fragments. As craniotomy is the most common form of the operation, it is by many authorities considered as synonymous with embryotomy, but I shall follow the custom of those who use the latter in a general sense, or embracing all operations involving the cutting or breaking up of the fœtus and its removal from the pelvis by piecemeal.

EMPLOYED BY THE ANCIENTS.—In its simpler or ruder forms it is the most ancient of obstetric operations, excepting, perhaps, the use of the fillet. Until the introduction of delivery by the forceps it was the usual means of artificial delivery in cases of arrest of labor. But in France and other Roman Catholic countries it was always until recently limited by the leading accoucheurs to cases where the fœtus was dead; as a church dictum held it to be a mortal sin to destroy *in utero* a living fœtus, even to save the mother's life. An opposite rule has prevailed in England, where the safety of the mother has always been considered paramount to that of the child, so that when the latter could not be delivered alive by any of the ordinary aids of delivery it was considered right, in the interest of the mother, to destroy and extract it.

EMBRYOTOMY TOO FREQUENT IN GREAT BRITAIN.—Strange as it may seem, embryotomy was for many years subsequent to the invention of the forceps commonly practised even in cases perfectly adapted to the use of this instrument—especially in Great Britain, the home of the inventors of the forceps. This is strikingly illustrated by the difference in practice in the great Rotunda Hospital under its first and its last masters. The forceps was not used once in this celebrated institution in 21,867 cases under the mastership of Dr. Labbat; whereas embryotomy was frequently resorted to. Even later than this, from 1826 to 1833, during Dr. Collins's mastership, in a total of 16,414 labors, the forceps was used only in 27 cases, or in the proportion of 1 to 608; and in the

Royal Maternity Charity, in 48,996 labors, from 1828 to 1850, this instrument was used but 73 times, or once in 671 cases. These facts appear most astonishing when compared with the frequency with which this instrument was used in the Rotunda Hospital, under Dr. Johnston, from 1868 to 1875. In a total of 7862 labors he employed the forceps 752 times, or one in about 10 cases. His successor, Dr. Lombe Atthill, made use of it once in every 14 in cases, and once in every 29 out-cases of labor. It is not fair to assume that all of the first master's cases of embryotomy could have been delivered by the forceps, or that all the forceps cases under the later masters would have been subjects of embryotomy under the early masters, because many women were undoubtedly delivered under the care of Drs. Johnston and Atthill by the forceps, which Drs. Labbat and Collins would have let nature deliver after a prolonged and perhaps dangerous labor, yet they most certainly have destroyed numerous children which, under the practice of the former gentlemen, could have been saved. But while Drs. Labbat and Collins undoubtedly used the forceps too little and embryotomy too much, it is to be feared that Dr. Johnston employed it somewhat too frequently. Yet in this particular he has been surpassed by certain practitioners in the United States.

Conditions Requiring Embryotomy.—Embryotomy is demanded in cases where the child cannot be delivered either naturally, or by the aid of turning, or the forceps, and yet may be extracted through the natural passages when its bulk is diminished by perforating its head, or cutting it more or less to pieces. It is generally essential where the fœtus is mature in cases of deformity of the pelvis where the antero-posterior diameter of the brim is less than 3, and more than 1½ inches, or, according to some authorities, 1¾ inches. When this diameter is only 1½ or 1¾ inches the transverse must represent a fair amount of space, Leishman says 3 inches, or embryotomy is impracticable. The operation may be demanded in some cases where the conjugate diameter exceeds 3 inches. As, for example, in malacosteon pelvis; in deformities of the outlet; in a few cases of obstructed or complicated labor, such as locked twins, impacted transverse presentations, impaction owing to swelling of the soft parts, intra-uterine hydrocephalus, ovarian, bony, or malignant tumors, extreme cases of atresia of the vagina, and of rigidity and undilated and undilatable os uteri,

in severe cases of contraction of the uterus, in certain cases of rupture of this organ when the condition of the os renders version and forceps delivery impracticable; in a few cases of convulsions accompanied by extreme exhaustion, where for any reason the forceps or turning is not available. Several of the latter conditions are so remediable by the modern improved methods of treatment that embryotomy is very rarely called for nowadays to overcome them. This is true, especially as regards a rigid and undilatable os uteri, which may commonly be overcome by chloral, chloroform, ether, or dilatation by Barnes's bags; or by incisions, so that the child may be delivered, if not naturally, at least by the forceps or turning.

Embryotomy when the Fœtus is Dead.—Embryotomy may be called for in cases of prolonged labor where the child is dead, especially if the liquor amnii is evacuated. Where the fœtus is dead, but the bag of waters not ruptured, it may often be delivered more promptly, and with greater safety to the mother by podalic version, provided any other part than the pelvis presents. It is generally recommended in obstetric works that when the fœtus is dead, embryotomy should be performed in preference to either turning or the use of the forceps, on account of its supposed greater safety to the mother. While there are many cases where it is the safest operation, there are also many where the forceps and turning are equally if not more safe. For this reason, and the additional one of the uncertainty of most of the signs of fœtal death generally relied upon, the operator should act with great caution, and at least be sure of his diagnosis before resorting to embryotomy simply because of the supposed death of the child.

The Period for Operating.—No definite rule can be established for the time for performing embryotomy. Of course the sooner the better after its necessity has been established, for we must not delay, as was formerly the practice in France, until the death of the child, nor should we wait, if it can be avoided, until the patient becomes dangerously exhausted. Of course where there is a reasonable chance for the child to be born alive by the natural process, or by turning, or the use of forceps, we must delay the operation. Unfortunately, this unavoidable delay is the reason of the fearful maternal mortality.

Position and other Preliminaries.—The patient may be placed upon her left side, according to the English custom; but in the

United States we prefer the Continental European dorsal obstetric position, with the woman across the bed, lower extremities flexed, breech close to the edge of the bed, feet upon two chairs. The bladder and rectum must be emptied; and generally an anæsthetic administered. But the latter may be left optional with the patient and her friends.

Method of Performing Craniotomy.—The foregoing remarks are applicable to all forms of embryotomy; but in describing the modes of operating we shall commence with craniotomy.

Fig. 123.

Fig. 124.

The greater the dilatation of the os uteri, and the lower down in the cavity of the pelvis the head has descended, the greater will be the facility with which craniotomy may be performed. Still the operation is sometimes necessary when the dilatation is only sufficient to admit the necessary instruments, and when the head

is above the superior strait. An operation under the latter conditions is much more formidable than under the former.

Before describing the first step in craniotomy—perforation—a short description of the instruments used for that purpose will assist in the comprehension of the subject. They are called perforators, and are of various kinds. Some are constructed upon the principle of the trephine, and are used very much like the latter in cutting a circular hole through the skull. Although this form of the instrument is preferred by many obstetricians, especially on the Continent of Europe, yet the majority of accoucheurs in Great Britain and America object to it because it simply bores a hole in the skull instead of splitting it up, and have a preference for some modification of the Denman or Smellie perforating scissors, such as the perforator of Sir James Y. Simpson (Fig. 123), or Dr. Greenhalgh. The chief improvement consists in having the perforating end of the instrument, open by pressure upon the handles, instead of like a pair of scissors. The perforators of the late Professor Hodge, of Philadelphia, and of Professor Thomas, of New York (Fig. 124), are also very popular in the United States.

The preliminaries before mentioned being duly observed, and a proper number of assistants being at command, one to administer the anæsthetic, another to support the uterus by pressure upon the abdomen, and two others, if possible to secure so many, to support the knees, the operator introduces two fingers of his left hand into the vagina and os uteri, and allows their ends to rest against the most prominent part of the vault of the fœtal cranium. He should bear in mind that the cervix uteri is sometimes so thin that it is liable to be mistaken for the membranes, unless due caution is exercised to find the os uteri. The perforator is then cautiously passed along the palmar aspect of the fingers, which act as a guide and guard until the scalp is reached. This part of the operation is well represented in Fig. 125. Due care must be exercised to let the point of the perforator touch a solid portion of the skull, and not, as formerly directed, one of the fontanelles or sutures, because when the latter is the case the aperture is very liable to be obliterated by the subsequent overlapping of the bones during collapse of the cranium, and the proper discharge of its contents is thus prevented.

Having secured a proper point for perforation—preferably one of the parietal bones when most dependent—the end of the per-

forator is made to penetrate the scalp and skull at right angles to the surface by a semi-rotary boring motion. Having passed the instrument so far as the rest or stop, the blades are separated by pressure upon the handles so as to make a lacerated opening through the scalp and cranium. The perforator is afterwards withdrawn and reintroduced so as to make a second irregular gap at right angles to the first. The entire contents of the skull, embracing the cerebrum, cerebellum, medulla oblongata, and membranes, ought then to be thoroughly broken up by the perforator, so that they can easily escape through the opening during the pains.

FIG. 125.

When they do not readily escape, they may be scooped out or removed with a spoon, or washed out with a syringe. A thorough breaking up of the cranial contents, and *especially the medulla oblongata* and base of the brain, is not only necessary to insure their discharge and a collapse of the vault, but to prevent any possibility of the child when mutilated by the operation from being born alive. Such accidents have happened, greatly to the mortification of the operator and distress of the parents.

The crotchet, an instrument described in a former chapter, may be found useful in breaking up the contents of the skull, though, as will be seen presently, it is generally employed as a tractor.

Perforation of the After-coming Head.—The perforation of the after-coming head is accomplished by conducting the guarded point of the instrument behind the ear, or against the occiput, while an assistant pulls down, and holds out of the way, the body of the child.

Extraction.—If there is a necessity for rapid delivery we must commence the process of extracting the child immediately after complete de-cerebration. But if there be no such necessity, and the pains are still present, we may delay ten or fifteen minutes before making traction, for nature to cause a collapse of the skull, and to mould it to the pelvic cavity, and probably expel it. If the natural efforts be unequal to the emergency, we must delay no longer.

The Crotchet.—The older accoucheurs relied, and many of the present generation still rely, chiefly upon the crotchet for extracting the head. As it is very apt to slip or break through the parts when applied to any of the bones of the cranial vault, it must be well guarded by the finger, or a guard adapted to the instrument itself. But even then it is liable to lacerate the maternal tissues, either directly, or indirectly, by the sudden fracture of angular pieces of bone. It is found most useful in those cases where it can secure a firm hold upon the orbit, or within the foramen magnum, or against the sella turcica.

Craniotomy Forceps and Cephalotribe.—The comparative inefficiency of the crotchet, and the dangers and difficulties attending its employment, have induced practitioners to invent other instruments as substitutes. Hence the introduction of the craniotomy forceps and the cephalotribe as tractors and cranium crushers; the former heretofore being the favorite instrument with British practitioners, and the latter with the German and French accoucheurs. The cephalotribe, however, is growing into favor in Great Britain and the United States of America. We shall first describe the craniotomy forceps and its application in craniotomy, and afterwards call attention to the former very valuable instrument. There are various kinds of craniotomy forceps, such as those of Davis, Meigs, and Simpson. The cranioclast of Sir James Y. Simpson (Fig. 126) is a stronger instrument than his forceps, but answers the same purpose, and is besides a powerful compressor

and crusher. When it is in our obstetric bag we do not need the ordinary craniotomy forceps. It essentially consists of two almost straight blades crossing each other at the point of articulation, one of them being solid and thick, while the other has an elongated fenestrum for reception of the first blade when the instrument is

FIG. 126.

closed. The handles are much longer than the blades, and are partly of wood, and afford a firm grasp, so as to render the instrument powerful for either crushing or extracting. The peculiar manner in which the solid blade, when closed, rests in the other, gives it unusual power for breaking up thin, flat bones, so that

when the instrument is used simply as a tractor, care must be taken not to compress the blades too strongly. As a tractor only, it would be more efficient without the blades closing in this peculiar manner, but it saves the trouble of having two instruments.

A Case of Craniotomy.—I look upon the craniotomy forceps as so indispensable in certain cases of craniotomy, that I am astonished that a practitioner could think of having a set of obstetric instruments without it. Yet it is frequently absent from the obstetric bag. Only a short time since, two eminent practitioners perforated the head of a child and failed to extract it, just because they depended upon the crotchet. Being called in consultation, I had but little difficulty in delivering the child by means of a cranioclast, not Sir James Y. Simpson's, but one with two equal blades, in direct apposition. The woman had had several children, but they were mostly delivered by craniotomy. The only two born alive were small, and were delivered by the forceps. The one I assisted in delivering weighed eighteen pounds. In that case it is just possible that the physicians first in attendance might have succeeded in extracting the perforated head, had they passed the crotchet through the foramen magnum, or against the sella turcica.

Traction by the Craniotomy Forceps.—In a moderate contraction of the pelvis from deformity, it is sometimes possible to remove the head, by traction alone, with the craniotomy forceps, after perforation. Under these circumstances, one blade is to be introduced through the opening made by the perforator, and the other applied on the outside of the scalp. The fingers of the left hand should be used as a guide to the instrument, and a protection to the maternal soft parts.

Breaking down and Removing the Cranium.—When the head cannot be brought down by simple traction, it becomes necessary to break up the vault with the craniotomy forceps, or rather, with a more powerful instrument like Simpson's cranioclast. In this operation it is better, when practicable, to introduce the external blade between the scalp and the skull, while the other is passed within the latter, thus leaving as much of the scalp as possible as a shield to the parturient canal. A wrenching or twisting motion is then made in order to break off a piece of bone, which must be very carefully extracted, while the left hand protects the mother's soft parts. This process is repeated until we have re-

moved as much of the vault of the cranium as is necessary for the extraction of the head. If it be impossible to bring down the latter after the vault has been broken up, we should try Dr. Braxton Hicks's method of bringing down the face, chin foremost. This may be done by fixing the cranioclast over the face and forehead, and making traction downward and backward, according to Dr. Barnes's method, or by inserting a small, blunt hook, as recommended by Dr. Braxton Hicks, into, or through the orbit, and pulling the face downwards. By so doing, the opposition of the head is reduced to the smallest possible diameter —the one from the root of the nose, or ridge of the orbit, to the upper maxillary bone—not exceeding one inch and a half, and the transverse diameter not being over three and a half inches, the lower jaw not being taken into account, because of its being divided at the symphysis, and pushed aside, or simply pressed back out of the way.

Cranio-basilysis.—Besides the above method of extracting the base of the cranium, it has been proposed to crush it. Various plans have been tried for this purpose, especially compression by the cranioclast and the cephalotribe, but only with partial success. Professor A. R. Simpson read a paper upon this subject before the Obstetric Society of Edinburgh, June, 1880, in which he suggests the name of "Cranio-basilysis" for the operation of comminuting the base of the cranium in cases of obstructed labor, and recommended the use of an instrument of his own, called by him, the "basilyst."

At a subsequent meeting of the society, in February, he reported a successful operation with his instrument. The society was not very favorably impressed with the usefulness of the basilyst. So it is necessary to await further developments.

Delivery of the Body.—After the extraction of the head, the young practitioner is apt to imagine that he has surmounted all obstacles to complete delivery of the child. In ordinary cases of pelvic deformity, he is not disappointed, for very slight traction on the head, aided by the pains, if there be any, and abdominal pressure, will soon effect delivery. It is otherwise, however, in cases of extreme distortion. Under these circumstances, it becomes necessary to make strong traction backwards upon the head, so as to disengage the anterior shoulder, and bring it a little in advance, when the finger or blunt hook may be inserted in the

axilla, and the shoulder extracted, after which the other shoulder will glide over the perineum, and complete delivery soon follow; though sometimes it becomes necessary to use the finger or blunt hook to extract first one shoulder and then the other. When these means fail, resort must be had to evisceration, to be described hereafter.

Turning after Perforation.—Instead of removing the calvarium by piecemeal, after perforation, in difficult cases, delivery may sometimes be effected by turning, because, when the brains have escaped, traction by the feet, so as to bring the base of the skull, or smaller end of the cranial wedge, through the constricted portion of the pelvis first, the broader part, or vault, will be easily compressed, so as to enable the head to pass through a smaller opening than would be possible with the base of the wedge, or vertex, foremost.

Cephalotripsy.—Dunglison defines cephalotripsy as "the operation of crushing the head of the fœtus in utero." But this definition is imperfect, because the tractive power of the cephalotribe is ignored. This instrument was invented by A. Baudelocque, not the celebrated accoucheur of that name, but his somewhat less distinguished nephew. The cephalotribe, like the forceps, consists essentially of two long blades, crossing each other when properly applied, and working on a pivot, but is heavier and stronger than this instrument. There are many modifications of it. We find some with only a cranial curve; others with both the cranial and pelvic curves; some without, and others with, fenestræ. Generally speaking, the French and German instruments are much heavier, and more powerful than those of the English, and are, therefore, better compressors, while the English cephalotribes may be relied upon as more useful tractors. They are sometimes made without, and occasionally with, fenestræ. The blades are approximated by means of a screw at the end of the handles. Braxton Hicks's modification of Simpson's cephalotribe is a favorite instrument in Great Britain, although Dr. Mathews Duncan's cephalotribe is most generally used. In the United States, that of Professor Lusk (Fig. 127) stands very well with the profession.

A Compressor, or Crusher and Tractor.—The cephalotribe acts both as a compressor or crusher, and tractor; the French and German instruments being particularly adapted for the former purpose,

while the lighter English cephalotribe is equally adapted to compression and traction. Pajot and a few others maintain that after the cranium has been sufficiently crushed, its expulsion ought to be left to the efforts of nature. He, however, finds very few supporters of his extreme view in Great Britain and the United States of America.

It is only recently that the cephalotribe, though long used in Germany and France, has been recommended by English and American authors. It was a long time before Sir James Y. Simpson

FIG. 127.

could be induced even to try the instrument, and, after trying it, he always preferred his cranioclast to it. And, what is a little singular, just as Braun's cephalotribe, or a similar instrument, commenced to find its way into British practice, Braun himself began to use, and recommended, the English craniotomy forceps, or rather Simpson's cranioclast; but was careful to modify it to suit his own views upon the subject.

Suitable Cases for Cephalotripsy.—The cephalotribe may be used in nearly all cases of deformity and obstructed labor adapted to the use of the craniotomy forceps, except in great contraction of the pelvic cavity and outlet, when it would be impossible to separate the blades sufficiently to grasp the head of the fœtus.

Many obstetricians prefer the English or American instrument to the craniotomy forceps, in all instances of moderate contraction or obstruction of the superior strait; while others use the cranioclast in these cases, and the heavy German or French instrument for extremely difficult cases where it is necessary to crush, or at least properly tilt the base of the cranium so as to enable the head to pass the pelvic constriction. Some practitioners possess but very little confidence in the power of the cephalotribe to crush the base of the calvarium. But the best testimony tends to prove that this can be done by the stronger Continental, if not by the lighter English, instrument. It may be used on the imperforated, and the perforated, head; but is generally and more successfully employed after an opening has been made in the skull.

Operation.—The cephalotribe is introduced like the ordinary obstetric forceps, one blade at a time. Of course all the preliminaries as to bladder, rectum, position, etc., as previously pointed out, must be enforced. Some prefer a straight instrument, because it may be more easily rotated than one with much of a pelvic curve. The general preference, however, is for one with only a slight pelvic cure, for the reason that while it is as readily rotated as the straight instrument, it is more easily introduced, and gives perhaps a firmer grasp. As it sometimes becomes necessary to introduce the cephalotribe before the os uteri is sufficiently dilated to allow its passage, it may become necessary to use artificial dilatation with some of the fluid dilators. Of course the blades of the instrument must be inserted in the uterus with the utmost care, guarded by two fingers of one or the other hand. The general direction about supporting the womb through the abdomen during the operation, must not be forgotten.

When the blades are properly introduced they will lock easily. If they do not and cannot be adjusted by the fingers within the vagina, one of them, and sometimes both, ought to be withdrawn and reintroduced. The head is often so pressed forward by the promontory of the sacrum, that in order to secure upon it a firm

grasp it sometimes becomes necessary to press the handles well back against the perineum.

We may occasionally in moderate deformity be able to select the point where the blades should be applied, but it frequently becomes necessary, especially in marked contraction of the antero-posterior diameter of the brim, to introduce them in the transverse diameter, because there is more room. Under these circumstances the blades grasp the fœtal head in its long or fronto-occipital diameter. When the instrument is in place and locked, compression is commenced by winding up the screw steadily and slowly. After the skull is fully crushed in one direction, we may attempt extraction of the fœtus. Where the conjugate diameter of the brim is not less than two inches, this may in some instances prove successful, and when it does not, the instrument must be withdrawn and applied to another part of the head. A second, and occasionally a third, compression in different parts of the cranium may occasionally be necessary in order to crush the parts sufficiently for extraction, during which the smallest fœtal must be brought in relation with the smallest pelvic, diameter, and the soft parts of the mother protected from sharp fragments of the skull. No matter whether the cranium is broken up by the cranioclast—which, however, can never completely destroy its base—or crushed by the instrument now under consideration, or by Simpson's basilyst, extraction of the child is impossible with the antero-posterior diameter of the superior strait of less than one inch and a half. Some authors limit the operation of craniotomy and cephalotripsy to cases where the conjugate is not less than $1\frac{3}{4}$ inches, and others 2 inches. Of course the success of the operation depends somewhat upon the transverse diameter also, which should not be under 4 inches (some say 3) when the conjugate is only $1\frac{1}{2}$ inches, but may be a little less when the conjugate is 2 inches.

After extraction of the head by the cephalotribe, if there is trouble in delivery of the body, as is occasionally the case, the same measure should be resorted to as directed for a like condition after craniotomy with the cranioclast, with the addition, however, of crushing the chest with the cephalotribe, which is sometimes sufficient of itself to enable the trunk to be withdrawn, or even expelled by the natural powers.

Two Other Methods of Diminution of the Fœtal Head.—One of these, suggested by Dr. Barnes, but never as yet carried into practice, is to cut up the head by means of a strong, single wire écraseur applied to different parts of it, and in various directions. The other is the plan of Van Heuvel, which consists in re-

Fig. 128.

moving the head in sections by a very complex instrument called Van Heuvel's Forcep Saw (Fig. 128), which consists essentially of a cephalotribe containing between its blades a chain saw worked by a very complicated mechanical power. The Belgian practitioners consider the reduction of the head by this instrument as

more easy and effectual than by the cephalotribe or craniotomy forceps.

Evisceration.—This is one of the forms of embryotomy employed in difficult labors where some other part than the head presents. In transverse presentations, for instance, where turning is impracticable and decapitation is not deemed desirable; though it may sometimes be resorted to after the operation of craniotomy or cephalotripsy, in order to remove the trunk.

It essentially consists in perforation of either the thoracic or abdominal cavity, or both cavities,—which is more common,—and in the removal of the viscera. The ordinary method of performing the operation in a transverse presentation with the arm protruding, is to seize the latter and pull down the thorax, in order to render it more accessible, and fixed and steady, and then to pass the perforator into its cavity and to make an opening sufficiently large for the removal of its contents after the viscera have been broken up by means of the perforator; after which the abdomen may be opened, either directly, or preferably through the diaphragm, and the abdominal organs broken up and extracted. If, as is desired, the body should now collapse or bend like a hinge and the inferior extremity of the fœtus descend, so that the knee or foot can be reached, extraction becomes quite practicable. It is often, however, necessary to divide the spinal column by some appropriate instrument introduced through the opening in the thorax or abdomen. A strong pair of scissors will commonly answer this purpose. The crotchet may also be usefully applied to the inside of the fœtal pelvis, and traction made to bring down the pelvic extremities.

In transverse or shoulder presentations, where the neck of the child can be easily reached, decapitation is a much more simple operation than evisceration, and should be preferred. The neck can be made more accessible in these cases by pulling down the arm, if it protrudes, or pulling down the neck directly with the blunt hook. The operation has been described in another chapter.

When evisceration is required after extraction of the head in cranial presentations, especially as a sequel of craniotomy, it must be performed in a manner similar to the operation in transverse presentations.

When by the various methods of embryotomy we fail in extracting the child, our last resort is the Cæsarean operation, to be described in the next chapter.

CHAPTER XXXVI.

CÆSAREAN OPERATION; OLD METHOD—PORRO MODIFICATION—LAPARO-ELYTROTOMY—SYMPHYSEOTOMY.

THE Cæsarean section, or gastro-hysterotomy, essentially consists of an incision through the abdominal and uterine parietes for the purpose of extracting a fœtus, whether dead or living, when the natural passages are so constricted or obstructed, that even a mutilated child cannot be delivered through them, or when the pelvis being normal, the fœtus itself is so abnormally large that it cannot be extracted even by piecemeal. It may be performed upon a *living woman* in order to save *both herself and child*, or to save herself only when the fœtus is dead; or it may be performed upon a *recently dead woman* in the *interest of her unborn child*, even when there is no disproportion between the latter and the maternal pelvis.

ITS ANTIQUITY.—The operation so far as it relates to the extraction of a child from its dead mother dates back to 508 B.C., but the first record of its having been performed upon a living woman dates back to 1491 A.D. Some authorities contend that this apparently well-authenticated operation, and most of those reported by Rousset in 1581, were simply cases of gastrotomy—having been performed after the child had escaped into the peritoneal cavity from rupture of the uterus. The Cæsarean section upon women dying during advanced gestation or labor, was not only performed as a custom by the ancient Greeks, Romans, and Italians, but in many instances in compliance with the law of the respective countries. It was decreed by the Roman Emperor Numa that no pregnant woman should be buried until this operation had been performed to remove the fœtus. It is stated that the King of Sicily, about the year 1750, sentenced to death a medical man for not complying with a similar law. It is recorded that Julius Cæsar, Æsculapius, Scipio Africanus, Manilius, and Andria Doria, were extracted by this operation. There is proof, however, that the first personage was not so born. After the publication of Rousset's work in 1581, gastro-hysterotomy upon

the living, as well as the dead woman grew rapidly into favor, until discountenanced by Ambroise Paré, Guillemeau, Viard, and Marchant. In fact it was so frequently performed during this period as to call forth the remark from Scipio Merunia, a Dominican friar, that the operation was as common in France as bloodletting in Italy. It received from the opposition of these distinguished men only a temporary check, for it again revived in the seventeenth century, to divide the medical profession into two warmly opposing parties, one condemning, and the other unduly advocating its performance. The operation having the support of the Roman Church, because, unlike embryotomy, its tendency is to save rather than destroy the child, has always been more popular in France and other Catholic countries than in Great Britain or the United States, where the mother's life is considered paramount to that of the child. At the present day it is regarded almost entirely from a scientific, instead of a religious, standpoint, but is still performed far more frequently in France than in Great Britain. In the former country it is looked upon as an operation of election, and is often performed in preference to embryotomy, but in the latter nation it is almost universally acknowledged simply as a *last resort*.

Limits of the Operation on the Living Woman.—As a rule, the Cæsarean section is not practised in England except when the conjugate diameter is less than 1½ or 1¾ inches, and the transverse less than 3 inches. There are a few exceptions in malacosteon patients.

In France, when the smallest diameter of the pelvis does not amount to 2½ inches, a delivery by the natural passages is considered impossible except by mutilation of the fœtus or the performance of the Cæsarean section—the latter being generally selected. It is sometimes preferred even when the smallest diameter is 3½ inches, provided it is certain that the fœtus is living; for unlike the English, the French prefer to risk the mother's life rather than that of the unborn child.

Conditions and Causes Requiring the Operation.—Gastrohysterotomy is required in all cases as a *dernier ressort* when delivery of the pregnant woman by the natural passages is impossible even when the fœtus is mutilated. This is generally owing to a deformity of the pelvis, but may be due to some one or more of the numerous obstructions of the parturient canal, or to an

abnormal size of the child, especially its head, as in intra-uterine hydrocephalus. The most *usual* deformity arises from *rickets*, but the most *serious* from *osteo malacia*. This is particularly the case in Great Britain, where the latter disease is somewhat prevalent. But even where the bony pelvis and the child are of normal size, the cavity of the former may be so obstructed by solid tumors, ovarian or fibrous, or by carcinoma of the cervix and os uteri, as to require the operation.

Cæsarean Operation after Death of the Mother.—It has already been stated that gastro-hysterotomy was among the ancients performed upon the mother after death only. The post-mortem operation is still recognized as proper when the mother dies during the last months of pregnancy or labor. Unless the operation be executed immediately after death, it is almost hopeless, for there is but little doubt that reported cases of extracting a living child many hours, or several days after the death of the mother, are either fabrications, or instances of operations performed upon women in a trance. Even the often-quoted case of the Princess of Schwarzenburg, who perished one night in a fire at Paris, and from whose body it is asserted by Professor Gardien a living child was extracted on the following morning is undoubtedly a fabrication, except as to the death of the lady as stated, because it has been fully ascertained that she was only four months pregnant, and that she was charred so badly that a Cæsarean operation was impossible. In fact she was burnt to a crisp mass beyond recognition, and her body was only identified by an ornament, known to be worn by her, being found upon her neck. There are, however, a few apparently well-authenticated examples of the extraction of a living child one or two hours after the death of the mother. Nevertheless the fact, as might be inferred from the intimate relations between the mother and child, is that the latter almost universally ceases to live within five to thirty-five minutes after the former has expired. The very time lost in fully determining the death of the mother, and in performing the operation, even though the physician be present, and have his instruments with him, is generally sufficient to insure the child's death. It is therefore not strange that the Cæsarean operation after the death of the mother so seldom results in the saving of the child. The exact per cent. of survivals is not known, but out of 107 cases of post-mortem operations reported by Schwartz there was not one.

Among a few successful cases reported by others the operation was generally performed within a few minutes after the death of the mother. Unfortunately it is not always perfectly easy to tell exactly when the mother is dead, and errors in diagnosis have occurred, still we are bound to perform the operation in all cases where we can fully ascertain that the child is living and the mother dead, unless it can be delivered by the forceps, which is sometimes possible when the mother dies in labor.

MORTALITY TO CHILD AND MOTHER.—There is but very little in the Cæsarean section of itself to imperil the child. If the latter be living when the operation is undertaken, there is hardly any reason why it should not be after extraction, if the operation be skilfully performed, unless the neck should get clasped too strongly by the contracting womb after its body has been removed (which is very rare), and cause delay in the delivery of the head. Nevertheless according to statistical returns from all parts of the United States and Great Britain, it appears that a little over one-half of the children are lost.

As to the mother, the case is very different. The operation itself, either directly or indirectly, often proves fatal. This is particularly the case in Great Britain, where it is too often postponed until the woman is so exhausted from severe and prolonged labor as to be an easy sacrifice to any operation, especially to one so formidable as gastro-hysterotomy. There is also no doubt but what the haphazard manner in which it has heretofore been performed, not only in Great Britain, but everywhere else, has added immensely to the mortality. It is to be hoped that when the same care is taken in this operation as is used by modern ovariotomists, such as Thomas and Sims, of New York, Spencer Wells, of London, and Thomas Keith, of Edinburgh, the percentage of deaths will greatly diminish. Even the best surgeons of the large cities in various parts of the world have rarely taken the precaution to ligate and stanch all bleeding vessels, to free the peritoneal cavity of all sanguineous and other discharges, to apply antiseptic spray, to secure the drainage of the uterine discharges, to use in dressing soft, warm sponges, wrung out of dilute carbolized water, much less many other necessary details so essential to operations of the kind. But, worse still, the emergencies of the case generally demand the operation to be performed by the nearest physician. Consequently, in small towns and rural districts, it may

fall to the lot of an inexperienced and unskilful medical man. Yet statistics show that the mortality is less in rural districts than in cities; but, of course, this is owing to the presence of healthy air and food, and the absence of those septic influences so concentrated in large cities, and especially in large, crowded lying-in hospitals or maternities.

It is difficult to even approximate the ratio of mortality among mothers, because of the great difference, and, perhaps, in some cases, unreliability of the statistics, as collected, from various sources. We are told by Späth that during the present century there has not been a single recovery on the part of the mother after the Cæsarean section in the lying-in hospital in Vienna. It was stated by Bauden, in 1873, that there had not been one successful case in Paris for eighty years, though the operation had, in the mean time, been performed at least fifty times. Churchill gives the mortality from a general average of British and American practice as about two-thirds. But there is no doubt that America suffers in having her Cæsarean cases thus mingled with those of her British cousins, for it is notorious that the recoveries in Great Britain are far less than in America.

According to the latest and most reliable statistics of American operations, by Dr. R. P. Harris, of Philadelphia, it appears that in a hundred and twenty-two Cæsarean operations in the United States, fifty-one women were saved; and that in one hundred and thirty operations in the whole of North America, fifty-eight women were saved, the latter enumeration including the former.

The fœtal mortality in the one hundred and twenty-two United States cases proper, was sixty, and in the one hundred and thirty in the whole of North America, sixty-two.

The greater success of the Cæsarean section in the United States, over that of Great Britain, is partly due to the much more temperate habits of the women of the former country. Yet the chief difference lies in the fact that the operation has generally been performed much earlier during labor in the United States than in Great Britain. This was particularly the case up to the commencement of the last decade, but, according to Dr. Harris, we have been retrograding in respect to timely operations during the past ten years, and have consequently suffered a greater mortality, while our British cousins have lessened their ratio of deaths by more promptness and care in their operations.

The reader must not conclude from the foregoing remarks in relation to the mortality in Vienna and Paris, that there are no successful cases in Austria and France. The smaller towns and rural districts redeem, in a measure, the slaughter-house reports of the great lying-in hospitals of Vienna and Paris. And so, in a measure, do the statistics of operations on private patients in these great over-crowded marts of the world.

All statistics tend to prove that, while the operation is almost always hopeless in the poisoned atmosphere of the larger maternities of Europe, even when performed by their best operators, it is more hopeful in private practice in these great cities themselves, and far more so even under less skilled surgeons in the healthy rural districts. This difference, though not so marked, obtains also in America, where some of the operations have proved successful in healthful country places—when performed in the rudest manner—in one instance by the instruments of a pocket-case.

Mode of Performing the Cæsarean Section.—The bladder and rectum having been emptied, the patient is placed on a table upon her back, with her head and shoulders slightly elevated. Her thighs should be fastened, by a broad bandage, to the table. There ought to be a good light in the room, and a regular temperature of about seventy-eight Fahrenheit. As both chloroform and ether are apt to be followed by vomiting, their inhalation had better be dispensed with. It is probable that chloro-methyl may answer the purpose better. In some cases, local anæsthesia by ether spray may be sufficient. It is important to have several good assistants, one of whom should apply carbolic spray. Quite recently, I saw an experienced operator and his assistants in a case of supposed ovarian cyst, put into a state of excitement by two apparently, but, under the circumstance, highly important, little omissions on the part of the spray assistant. He had forgotten to make sure that the cork could be easily removed from his spray-bottle, so that the fluid could be replenished without loss of time, and to provide himself with a little wire to cleanse the spray-tube when choked up. So, when the fluid gave out, and the tube became choked up, there was not only confusion but delay before the proper corrections could be made. Hence, it is well, unless the operator knows his assistants to be careful in all things, to see to everything himself. The hands of the operator and as-

sistants, the ligatures, sutures, instruments, and sponges should be dipped in carbolic spray of the strength of fifteen grains of crystallized carbolic acid to a pint of tepid water, or thymol spray may be substituted. There should be an abundance of warm and cold water and towels, some liquor ferri subsulphatis, patent lint or cotton-wool, adhesive plaster, and oiled silk. It is necessary to have several blunt and sharp-pointed bistouries, straight and curved, a good supply of dressing and artery-forceps, abundance of silk and wire-sutures, but no catgut sutures lately so popular, as they fail to hold properly, even when tied with the utmost care. There ought to be on hand several sponge-holders, containing pieces of carbolized sponge, and a sufficient number of large needles, already threaded, some with wire. The above, with such instruments as are contained in an ordinary pocket-case, will be abundantly sufficient for almost any case.

Before commencing the incision, the uterus and abdominal parietes should be brought and kept in apposition by the hands of two assistants, one pressing with both hands from above and laterally, and the other with his two hands from below and laterally, so as to prevent, as far as possible, the liquor amnii and blood from entering the cavity of the peritoneum, and the abdominal viscera from escaping during the incision of the abdomen and the womb. As soon as the latter is opened, however, instead of keeping up the pressure as above directed, the uterus may be hooked up by a finger, or suitable forceps inserted at the superior and inferior angle, and kept in close contact with the anterior wall of the abdomen until this organ is emptied of its contents and ready to be closed by sutures or otherwise. Having everything in perfect working order, the operator, taking a convenient position at the right side or in front of his patient, makes his primary incision along the middle line of the abdomen, from a little below the umbilicus to about two inches above the symphysis pubis. One advantage in making the incision directly over the linea alba is to avoid wounding the epigastric arteries; another is that as no muscles are wounded, there is less general oozing of blood; and, in addition, there is less danger of the intestines being directly under the median, than a lateral incision. The only disadvantage is, that when the direction of the incision is carried into the uterus there is increased risk of wounding the placenta. If, for any

reason, it afterwards becomes necessary to extend the incision, it may be carried up above, and slightly to the left of the umbilicus. The skin, fascia, and parietal peritoneum are successively divided. The two latter being pinched up and divided on one or two fingers, or on a director, properly inserted.

The next step is to make an incision of five or six inches in length through the body of the womb, avoiding the fundus and cervix as much as possible, because the circular fibres there situated have a tendency to make the wound gape, and produce hemorrhage. We are requested by some authorities to ascertain the position of the placenta by auscultation prior to laying open the uterus. This is all right provided it can be done, but veteran operators give it as their experience that no time ought to be lost in this doubtful method of diagnosis, but that we should cut through the uterine walls, and if the placenta be in the way, separate it at one side, so as to reach and remove the child, or, what is perhaps better, remove both it and the child as quickly as possible. In order to extract the latter, some writers tell us to seize it by the feet first; while others, admitting this to be generally the easiest and quickest method, advise the head to be first seized, or otherwise it is apt to be caught when the child has been removed so far as the neck by the quickly and strongly contracting womb, and perhaps cause so much delay before it can be extricated, by lengthening the uterine incision or other means, that the fœtus may die. After the removal of the child and placenta, the uterus will generally contract so firmly as to stop further hemorrhage; if it does not, but on the contrary remains loose and lax, it ought to be stimulated and compressed by the hand. This is in conformity to the teaching of modern authorities upon the subject, but in direct opposition to that of some of the older writers, especially Ramsbotham.

Closure of the Incisions.—It is the custom of some operators to leave the uterine incision unclosed, trusting to the contractions of the womb for keeping its lips sufficiently in apposition to prevent hemorrhage and discharge of the lochia into the peritoneal cavity, and to allow healing.

Others, and I think correctly, insist on closing it by interrupted sutures of silver wire, or the continuous silk suture, one end being passed through the os uteri into the vagina, by which it may be withdrawn when becoming detached.

The carbolized catgut, once so popular in Europe for this purpose and abdominal surgery generally, has, on account of its great liability to become untied, lately grown out of favor. Before the closure of the abdominal wound, all hemorrhage must be stanched, and all fluids removed from the peritoneal cavity by clean, soft sponges dipped either in warm water or very dilute tepid carbolized water.

Dr. Marion Sims, in a late article upon the most successful ovariotomist, living or dead, Thomas Keith, of Edinburgh, asserts his belief that the great secret of his success lies in the conscientious manner in which he attends to all the details of the operation, and especially to the ones just mentioned, which are of as much importance in gastro-hysterotomy as in ovariotomy.

The abdominal wound should be closed, first by a line of deep silver-wire sutures placed one inch apart, from above downwards, and afterwards by a row of superficial sutures of finer wire or silk placed about half an inch apart. The deep sutures must be placed entirely through the peritoneum and walls of the abdomen, at about the third of an inch from the line of incision. The edges of the peritoneum being thus brought into apposition heal readily, and insure the closure of the peritoneal cavity. A very excellent method of passing the deep sutures is to arm a piece of wire with a needle at each end, and to pass each needle from within the wound outwards through its respective lip of the wound. When all the deep sutures are in place, the edges of the wound can be nicely coaptated and the ends of the wires properly twisted and clipped as in similar operations. Pads of carbolized lint or cotton-wool, secured by adhesive strips, are now laid over the wound, and a soft bandage, about a foot and a half wide, should be applied around the abdomen.

Keith's Method of Closing External Abdominal Wound.—Instead of the above plan of closing the external wound it might be better to adopt Thomas Keith's method, as used by him after ovariotomy. I quote from Sims's communication to the American Journal of Obstetrics, etc., for April, 1880.

"At last he is ready to close the external wound. He places, according to the plan of Spencer Wells, a broad, flat sponge, perhaps six inches long by three or four wide, within the peritoneal cavity overlying the exposed intestines. The object of this is to protect the intestines against cold during the time of passing the

sutures, and also to protect them from any blood that may drop into the peritoneal cavity from the needle punctures. He then passes two sutures at the upper angle of the wound, and two at the lower, according to the method of Spencer Wells; each suture having a needle at either side, and each needle passed from within the peritoneal membrane and out through the skin. The intervening sutures were passed rapidly with an awl-shaped needle, six inches long, with an eye at the point, according to the method of Peaslee. The sutures were passed through the entire thickness of the abdominal walls not more than from a quarter to the third of an inch from the edge of the incision, and embracing the peritoneal membrane. When the sutures were all introduced, the upper half of them were drawn up in their middle portions into the upper angle of the incision, and the lower half into the lower angle, where they were held by assistants, thus making clear the opening into the peritoneal cavity, by which he removed the sponge that had been placed there for protection, before the introduction of the sutures. When the sponge is removed, if it is bloody, he immediately begins the search of bleeding points, but if it is dry the wound is ready for closure; but before doing this he hastily thrusts a small sponge, held by a locked forceps, to the bottom of the pelvic cavity, to determine if it is still dry. If all is well, the sutures are all drawn tight, and each tied separately, while an assistant presses the relaxed abdominal walls together with his hands, in a line under and parallel with the course of the wound. The sutures are then cut off, each within an inch or two of the knot. In this case seven deep carbolized silk sutures were passed, with five intermediate surface sutures of horse's hair. The wound was dressed with thymol gauze, covered with cotton-wool and a flannel band. In cases like this he formerly used a glass drainage-tube before the days of antisepticism, but now he does it only occasionally."

AFTER-TREATMENT.—This essentially consists in perfect quietude of mind and body. No food or drinks should be allowed for the first few hours after the operation, unless the patient does not rally readily from the shock, when a little stimulus may be given. Ice is one of the best things to check vomiting. Beef-tea, milk, and other light nourishment may be allowed after the first twenty hours of the operation, and something more substantial after the first week. The temperature of the room ought to be comfort-

able, or between 70 and 78. The patient must be clothed in clean linen. Pain may be relieved by warm applications to the abdomen, a hypodermic injection of one of the salts of morphia, or an opiate enema or suppository. But the old habit of administering large quantities of opiates as a mere routine should be abandoned. Keith rarely gives more than one or two anodyne injections in the course of his treatment after ovariotomy operations, and instead of keeping the bowels bound up for a week by the administration of frequent doses of some preparation of opium, as used to be the routine practice of many, he causes them to be moved after a day or two by an injection, unless there is a contraindication. This at least relieves the bowels of flatus, the presence of which often gives much distress. The bladder should be emptied by the catheter two or three times daily, and the vagina gently syringed out once or twice in the twenty-four hours by a weak solution of carbolic acid. The dressings must remain undisturbed for about six days, though some authorities deem it advisable to remove the deep sutures on the third day, unless there be so much tympanitic distension of the abdomen as to endanger the reopening of the wound.

The Cervix Uteri to be Kept Open.—Great care must be taken to keep the cervix uteri patulous so long as is necessary after the operation to secure a free exit of the lochia. All that is usually needed to secure this result is to pass a probang, prior to closing up the incision in the uterus, from its cavity down through the cervix to the vagina.

After-Dangers.—It is by a faithful observance of the above details in the operation and after-management of the Cæsarean operation that we may hope to lessen its causes of mortality, which are hemorrhage, nervous shock, peritonitis and metritis, and septicæmia. Any of these sequelæ that may happen to arise must be managed upon general principles inculcated in other parts of this work.

The Porro-Cæsarean Operation.—This consists in the old operation so far as the removal of the contents of the uterus, after which this organ itself, with the ovaries, is drawn out of the abdomen, and excised at the cervix, which is previously constricted, until the complete cessation of hemorrhage. The stump is secured in the inferior angle of the abdominal incision. In many cases a drainage-tube has been inserted through Douglas's cul-de-sac and the vagina, and sometimes one through the wound itself

or at other points. Carbolic, or thymol, spray has generally been used; and all the details of the antiseptic treatment, as indicated in the description of the old method as being followed by modern operators, ought to be fully carried out.

It is called the Porro Modification of the Cæsarean Operation, after Professor Edoardo Porro, of the University of Pavia, Italy, who performed his first operation on the human female, May 21st, 1876, the patient recovering. Although Professor Porro will always be remembered as the successful inaugurator of this new method in Europe, it appears from the researches of Dr. Robert P. Harris, American Journal of Medical Sciences, April, 1880, that he was not the first to perform it, if the first operation of removing the uterus of a pregnant woman, July 21st, 1869, by Professor Horatio R. Storer, of Boston, can be cited as a case in point. The only reason it may not be is, that the idea of removing the uterus was secondary in his case, the primary intention being to remove a tumor, and then a dead fœtus, which, on account of pelvic deformity, could not be extracted through the natural passages, the uterus being removed as a matter of necessity to prevent the patient dying from hemorrhage.

However this point may be decided, it is evident that Porro's operation was at least suggested as early as 1768 by Dr. Cavallini, of Italy, and performed many times upon the inferior animals, especially bitches and rabbits, Professor Porro himself having previous to his operation on the human female performed it several times successfully upon rabbits. It does not appear, however, that he had ever heard of Cavallini's and Blundell's experiments, or Storer's unsuccessful operation.

Dr. Harris has with indefatigable industry collected from various parts of the world seventy-one operations by the Porro method, by which thirty mothers and fifty two children were saved. Four of these operations were in the United States—two of the four being in Philadelphia. In one of the latter cases both the mother and child were saved. In reference to the Porro operation Dr. Harris remarks: "Examined in all its details in different countries, and under different circumstances, I have formed the opinion that the Porro-Cæsarean operation, performed under the carbolic spray, and followed by proper drainage and the Lister treatment, will be found successful to the woman in about one-half of all the cases of pelvic deformity requiring its performance that are

brought for relief to lying-in-hospitals. What it will accomplish in private practice, or in the United States, where but one Cæsarean case in twenty-eight has been in hospital, I am not prepared to say."

If Dr. Harris's opinion is correct, the Porro operation will prove at least as favorable as the old Cæsarean section under like circumstances. I do not see the force of the objection urged by many, of its unsexing the woman. On the contrary it would seem that this ought to be a recommendation in its favor, in cases of deformity, as it would prevent the necessity of a repetition of any form of Cæsarean operation upon the same woman.

LAPARO-ELYTROTOMY.—This substitute for gastro-hysterotomy was first suggested by Jörg and Ritgen, in 1820, but first performed by Professor T. Gaillard Thomas, of New York, and subsequently by Dr. Skene, of Brooklyn, Dr. Hime, of Sheffield, England, Dr. Edis, of London, and Dr. Gillette, of New York—in all twice by Thomas, three times by Skene, and once each by the others, with the result of saving *four mothers* and *six children*. Some authorities claim for Dr. Physick a part of the honor of first suggesting it.

The danger of the Cæsarean operation lies in the opening of the peritoneum and the incision of the uterus—especially the latter. This is obviated by laparo-elytrotomy. But as the operation is applicable to fewer cases, and requires more assistance and greater skill than either the Cæsarean section or its Porro-modification, it is not likely to become so popular as its sanguine friends at first predicted. So far as Europe is concerned the Porro operation is being performed much more frequently, and with greater success than laparo-elytrotomy.

OPERATION.—An incision should be made from the symphysis pubis to the anterior superior spinous process of the ilium through the skin, fascia, and other superficial structures to the peritoneum, which must be carefully raised up by the fingers or metal retractors, until the juncture of the vagina and uterus is exposed. The vagina is rendered prominent by the insertion through the vulva of a large metal sound, and is incised slightly, and then torn by the fingers for several inches. The cervix being now in reach is drawn, by a blunt hook inserted into the os, into the iliac fossa, while the fundus uteri is pressed in an opposite direction by an assistant. The next step of the process is to introduce the

hand into the womb and remove the fœtus through the abdominal wound by turning. When the os is not sufficiently open for this purpose, it should be dilated by some fluid dilator just prior to the operation. The bladder must be emptied and kept out of the way by a sound during the operation, otherwise it is very liable to be injured.

Symphyseotomy.—Having described the only proposed substitutes for the Cæsarean operation worthy of the name, I shall simply call attention to another operation, which has been so universally condemned by modern accoucheurs as to be unworthy, in a practical sense, of description, and yet the medical world was at one time equally divided in its praise and condemnation. When the operation was first suggested to the Academy of Surgery, in France, in 1768, by a student of medicine named Sigault, it was contemptuously rejected. Nothing daunted, the young man continued to advocate his pet operation, and in 1777 performed it successfully. The Academy of Surgery, after an investigation, as if to make amends for its former supposed harsh action, presented a gold medal to the young surgeon, who for a time was honored as a great benefactor to his race. It was, however, soon found that the operation was practically almost useless, hence the revulsion of popularity towards its author.

The operation essentially consists in a division of the symphysis pubis and separation of the pubic bones. It is easily performed, and really has the effect of increasing the circumference of the superior strait considerably, but lengthens the conjugate diameter very little. Dr. Churchill thinks that the latter would be extended only from $\frac{1}{3}$ to $\frac{1}{2}$ an inch, if it were possible to separate the symphysis as much as four inches.

As the usual and most marked deformities are in the conjugate diameter of the brim, the operation would be practically useless where most needed, and the great risks of its performance, primarily and secondarily, would condemn it in the lesser degrees of pelvic contractions where it might otherwise be practicable. It seems, nevertheless, that Professor Ottavio Morisani has lately performed the operation in Naples with success to both mother and child.

CHAPTER XXXVII.

ANÆSTHETICS IN PARTURITION.

THE principal agents employed in the practice of obstetrics for the production of anæsthesia are ether, chloroform, bichloride of methylene, and chloral. The first two have been in use in both surgical and obstetric practice in all parts of the world for over a third of a century, and are still more employed than other anæsthetics which have more recently been brought to the notice of the profession.

All of them, excepting chloral, are chiefly and most advantageously administered by the inhalation of their vapors. Ever since the thirteenth century frequent attempts have been made to produce anæsthesia by the inhalation of medicinal or chemical vapors. The experiments of Sir Humphrey Davy, in the beginning of this century, upon the remarkable influence produced upon the nervous system by the inhalation of nitrous oxide gas, gave for a time great promise of success in this direction. The practical results of these experiments did not meet the high anticipations of the experimenters, and the gas was for many years thereafter inhaled only for amusement, being considered of no practical value as an anæsthetic. In 1844 Horace Wells, of Connecticut, having succeeded in having one of his own teeth extracted without pain while under its influence, subsequently tried the experiment upon others with good results in some cases and failure in others. Dr. Morton, a dentist, and pupil of Wells, having in 1846 successfully used the vapor of ether as an anæsthetic, instead of nitrous oxide gas, subsequently administered it to a man with most satisfactory results, while Dr. J. C. Warren removed from his neck a tumor. The whole medical world was electrified by the great discovery, and for more than a year ether was the only anæsthetic agent employed in surgical operations. In 1847 the anæsthetic properties of chloroform were discovered and brought to the notice of the profession by Professor James Y. Simpson, of Edinburgh. It soon became the favorite and almost exclusive anæsthetic for obstetric as well as surgical

cases in Great Britain, and even in many parts of the United States of America.

Ether, however, continued to be the favorite agent throughout the Eastern part of the latter country, and is now growing into more general favor both in America and Great Britain. In short, the tendency at present is to undervalue chloroform and overrate ether. This is one of the numerous examples of the mutability of professional opinion.

In France the vapor of chloroform still retains its reputation as the best anæsthetic in surgical and obstetric practice. Although in Great Britain it is losing ground in general surgery, including obstetric and gynæcological operations, it is still preferred in ordinary cases of natural labor where it is unnecessary to fully anæsthetize the patient.

In the United States the reaction against chloroform is so great that the majority of the profession even discard it in ordinary midwifery practice. This is being done by thousands of practitioners who have used it for years without bad results, and who have never seen any evil arising from its judicious administration. This is as strange a psychological phenomenon as was manifested by many intelligent and able medical men soon after the discovery of the anæsthetic properties of ether and chloroform, who argued against their use because in their judgment it was sinful to relieve women from pain in labor. But I do not wish to be misunderstood, for although it is probable that when ether shall be used as extensively as chloroform it will be found that almost as many deaths result from it as from the latter agent, yet as it is probable that ether is somewhat the safer agent when full anæsthesia is required, it is natural for it to be used under such circumstances. But on the other hand, as it is just as safe as ether when administered in small quantities and intermittingly, as is sometimes done in the second stage of ordinary labor, there can be no reasonable ground for its being entirely discarded, especially as it acts quicker and more pleasantly, and creates less excitement than ether. It is also less apt to produce vomiting. In obstetric operations, and all other cases where complete anæsthesia is desirable, it may be better to use ether, if it be true, as alleged, that chloroform is more apt to produce a failure in the action of the heart.

It is unquestionably true that both ether and chloroform have been too freely and carelessly employed in ordinary obstetric prac-

tice. It has been the custom of many physicians to keep their patients under the influence of one of these agents during the greater part of labor, moderately during the first, but fully during the whole of the second stage. It is a wonder that many deaths have not occurred under such treatment. If not causing death directly, it has indirectly, by rendering the womb le-s apt to contract in a normal manner after the expulsion of the child, or the after birth, thus leading to post-partum hemorrhage.

The too free use of chloroform or ether is productive of other evils besides hemorrhage, resulting from imperfect contractions of the uterus, not the least among which is uterine inertia. It may also result in a tedious convalescence, and even in a poisonous condition of the maternal blood, with morbid vigilance and puerperal mania, and in a few instances in asphyxia of the child. A most curious phenomenon in the effects of anæsthetics is their power to suspend pain without annulling the expulsive power of the womb, so that labor may take place while the woman is fully under their influence. Indeed, it has been maintained by a great many physicians that anæsthetics never lessen uterine action. This opinion was formerly much more prevalent than now. A trial of over thirty years has caused most medical men of much obstetric experience to believe that full anæsthesia will generally weaken or retard, and occasionally annul, the expulsive action of the womb.

The most experienced accoucheurs of the present day rarely use chloroform or ether in natural labor until the second stage has commenced, and frequently not until its termination, when the propulsive pains are at their height. They seldom aim at the production of complete insensibility, loss of motion and of consciousness, but only at producing a sense of great relief, by partly annulling and deadening sensation, and calming nervous irritability. They do not deem it necessary to employ it even in this moderate way in every case of labor. When parturition is perfectly natural and unattended with much pain, it is better not to administer it, especially in primiparæ and women who have never used it.

How to use Chloroform and Ether.—About half a teaspoonful of chloroform should be put upon a hollow sponge, or a handkerchief, or a napkin contained in a paper cone, and held from one to two inches from the mouth and nostrils at the commence-

ment of every pain, or slowly dropped upon a thin cloth or linen handkerchief laid over the mouth and nose.

The general rule to be borne in mind is, that the operation should be so conducted that ninety-six parts of atmospheric air may be allowed to commingle with four of the chloroform at the time of inhalation. The woman should be permitted to recover from its influence between pains. It may sometimes when the propulsive pains are exceedingly violent be expedient to render the suffering patient entirely unconscious of her misery, particularly near the termination of the second stage. It is thought by some that the addition of one part of pure alcohol to two of chloroform is a preventive of the retardation of labor and uterine inertia. Others prefer to use a combination of one part of pure alcohol, two parts of chloroform, and three of ether; others again equal quantities of chloroform and ether. I have frequently used the latter two combinations with perfect satisfaction. In the inhalation of ether, the inhaler, commonly a piece of patent lint, or a towel, or a hollow sponge, or the latter surrounded by a towel, should be applied, after a few preliminary inhalations, mixed with more or less air, close to the mouth and nostrils, so as to exclude the air. The quantity of ether used must be much greater than that of chloroform. The average quantity of ether for the production of full anæsthesia in an adult is five ounces, and of chloroform three drachms. The latter is more pleasant to the patient, much quicker in its action, and far less apt to create a preliminary excessive excitement, than the former. It probably is also more relaxing in its effects, and therefore preferable to ether in rigidity of the cervix uteri and vagina, and especially in turning, where its power of retarding uterine action, so objectionable under ordinary circumstances, is highly advantageous. Still, as both professional and public opinion, in the United States particularly, are becoming so opposed to its use, and as it may possibly prove more dangerous than ether, the accoucheur assumes a great responsibility in its administration in prolonged obstetric operations, and should, therefore, under such circumstances, employ ether. In the second stage of ordinary labor chloroform may, as before stated, be moderately employed, either alone or in combination with ether, at the commencement of each pain.

Caution in the Administration of Ether and Chloroform.—As arrest of respiration is the chief source of danger in the in-

halation of ether, we must direct most careful attention to the respiratory movements, not neglecting, however, the action of the heart. In chloroform inhalation the main source of danger lies in arrest of the action of the heart, yet we must watch the movements of both the latter and the lungs. Whenever chloroform or ether continues, after a reasonable time for the preliminary excitement to subside, to excite instead of calming the patient, it must be withheld. Its administration should also be stopped when it greatly weakens the expulsive efforts.

Treatment of Dangerous Symptoms.—If the heart fails, the vapor must be withdrawn, and the patient inverted by holding the feet up, so that the head may hang down. If the lungs fail, the tongue must be drawn well out of the mouth; artificial respiration, flagellation of the chest with a towel, wet with cold water, and the application of diffusive stimulants to the nostrils should also be tried; and, if other means prove unavailing, faradization of the muscles of respiration might be found of service. When there is failure of both the heart and lungs, all the above methods of resuscitation may be resorted to if necessary. In fact, any one, or all of them may be employed in cases of great danger from the inhalation of either chloroform or ether, as there may be no time to draw a nice distinction between approaching death by the heart or lungs. In all cases where it is necessary to administer an anæsthetic to the full surgical extent, it is better to intrust this duty to an assistant, as the practitioner cannot safely attend to it and the operation at the same time.

Bichloride of Methylene.—This agent is considered by some surgeons as a good substitute for chloroform or ether in surgical and gynæcological operations, but it is, as yet, little used in ordinary obstetric practice.

Hydrobromic Ether, or Ethyl.—This anæsthetic has lately been introduced to the notice of the obstetrician, and is thought highly of by Dr. Lawrence Turnbull, who says: "I administered it, February 24th, 1880, to Mrs. R. T. P., aged thirty, a lady with a narrow pelvic outlet, and very rigid os uteri, who had been in labor with her fourth child for nine hours, having made but little progress. The hydrobromic ether was used in tablespoonful quantities, when the pains were most intense and distressing, and gave as prompt relief as ether, and yet it did not interfere in the least with the expulsive efforts. Her pulse was only increased six

beats; no apparent disturbance of her respiration, only a feeling of fulness in the chest. The baby, a female, was born full of life and vigor, and cried lustily. The patient had not a bad symptom from the use of the anæsthetic. The whole quantity employed was five tablespoonfuls. There was no hemorrhage, and the placenta was expelled with but slight traction."

Further experiments are necessary before the bromide of ethyl, or hydrobromic ether, can be recommended in surgery or ordinary obstetrics as a useful and safe anæsthetic, especially as several deaths from its use by some of the most eminent surgeons and gynæcologists in the world have already been reported. Dr. Carl Jungk, in the Therapeutic Gazette, states that the hydrobromic ether used in two of the fatal cases was impure, and entirely unfit for purposes of inhalation.

Until the practitioner can be sure of its purity, he had better not use it, even in the most simple cases.

Chloral.—In the first stage of labor, we often find hydrate of chloral an invaluable substitute for chloroform or ether, which, as a general rule, ought not to be used until the second stage. It is particularly indicated where there is rigidity of the os uteri, and where the patient is nervous and irritable from the loss of sleep. It does not ease pain so well as chloroform, but produces a calming, somnolent condition, when properly administered, which is highly beneficial during the harassing pains accompanying dilatation of the os uteri. It may be administered in doses of fifteen or twenty grains, repeated, if necessary, every twenty minutes until three or four doses have been given. If any further use of it is required, the interval between doses should be lengthened to about one hour.

The Doctor's Responsibility.—While a large majority of patients are not only willing, but often urgent, to have their suffering assuaged by an anæsthetic, there are some obstinately opposed to its use. Even when the patient is eager for its soothing influence, the nearest relations and friends, and sometimes the nurse and other attendants, are violently prejudiced against its administration. If, under these circumstances, the doctor should allow his patient to inhale an anæsthetic in any quantity, no matter how small, he must be prepared for blame in the event of any real or imaginary trouble accompanying or following labor.

CHAPTER XXXVIII.

INDUCTION OF PREMATURE LABOR.

In order to avoid the danger to the mother, attendant upon the Cæsarean section, and the death of the child from embryotomy, when labor is allowed to proceed to the full term in severe cases of obstruction from tumors and deformities of the maternal pelvis, induction of premature labor is allowable.

The mere fact of confounding abortion, or expulsion of the child before its viability, with premature labor, or its expulsion after its viability, but before the full term of pregnancy, was probably one reason of the strong and bitter opposition to the induction of the latter, manifested in Germany and France prior to the present century. This was particularly so in the latter country, where the Roman Catholic Church was zealously mindful of the interest of the child, even sometimes at the expense of the mother. But, after it was generally understood that the operation, in its restricted and true sense, is commonly in the interest of both the child and mother, and is not immoral, it was no longer condemned by the leading French authors. The operation has been a favorite one in England ever since it was sanctioned by a council of eminent medical men in London, about the year 1756, and more particularly after its successful performance shortly thereafter by Dr. Macauley. It was performed for the first time in Germany by Wenzel, in 1804, and in France by Stoltz, in 1831. Of course it is liable to abuse, and has been unnecessarily and recklessly resorted to by some of its most ardent admirers, but this is no valid objection to its usefulness.

The operation ought not to be performed prior to the twenty-ninth week of gestation, as the child born before that period almost invariably perishes. Other conditions being favorable, the nearer the full term of pregnancy the greater is the chance for the child, but the cause necessitating the operation will often demand its early performance.

Causes Requiring the Operation—1. Contraction of the Pelvic Brim.—The cases in which it has been most frequently per-

formed, and for which it was originally proposed, are those of contraction of the brim of the pelvis, usually in its antero-posterior diameter, so that a fœtus at full term cannot pass through it, and yet not so great as to prevent the descent through it of a fœtus at an earlier date. As a rule the fœtal head in cases of contraction of the conjugate diameter of the pelvis lies with its occipito-frontal diameter transversely, and its bi-parietal diameter corresponding with the contracted brim. It is, therefore, highly important to know the probable measurements of the bi-parietal diameter of the fœtal cranium at different periods of the last few months of pregnancy. According to the estimates of Stoltz, this diameter between the thirty-second and thirty-third week of gestation is about two inches and three-quarters; between the thirty-fourth and thirty-fifth it is about three inches, and between the thirty-sixth and thirty-seventh about three inches and a third. It becomes necessary then in a case where the conjugate is two inches and a half, or less, to operate not later than the expiration of the seventh month. On the other hand, if this diameter is three inches and a half, other things being favorable, the operation may be postponed until about the thirty-seventh week of gestation, when the chances of saving the child are almost as good as at term. This is, as a rule, the latest period at which premature labor should be brought about in pelvic deformities of the brim, as there are other means of removing the child when the conjugate diameter is not less than three and a half inches, such as by turning, or the forceps. Where the antero-posterior diameter of the pelvis is less than an inch and three quarters we cannot hope to deliver by the induction of premature labor, but may resort to abortion at about the sixth month, as the alternative is the Cæsarean section.

2. A Narrowing of the Transverse Diameter of the Inferior Strait.—As natural delivery at term may be rendered impossible by the above deformity of the pelvis, the induction of premature labor may become desirable in the interest of both the mother and the child.

3. Exostosis or Fibrous Tumors of the Pelvis.—If these offer an insurmountable obstruction to labor at term, without a reasonable probability of relief by turning or the forceps, labor should be artificially anticipated so soon as the child is old enough to survive the operation.

Measurements.—As our means of ascertaining the dimensions

of the inlet, the outlet, and the cavity of the pelvis, especially during gestation, are only approximative, we must be exceedingly cautious in coming to conclusions. This is particularly so in cases of a first pregnancy. In multiparæ the history of previous labors will be of great service in confirming the results of pelvic measurements. For instance, if it be ascertained that embryotomy or some modification of the Cæsarean section became necessary in prior confinements, especially if repeated and by different accoucheurs of experience, we would have abundant reasons, if not annulled by our own examination, of the necessity of the induction of premature labor.

4. Cases of Sudden and Severe Attacks of Hemorrhage, especially Placenta Prævia.—Under the head of accidental and unavoidable hemorrhage it has been stated that the induction of premature labor occasionally becomes necessary in order to save the mother's life, and at the same time increase the chances of that of the fœtus.

5. Doubtful Cases.—While the foregoing cases clearly point out premature delivery as an occasional means of relief, there are many others of a more doubtful character where it has been recommended by eminent obstetricians—such as cases of habitually large size of the fœtal head, cases of convulsions from albuminuria clearly arising from pregnancy, chorea, mania, ascites, excessive anasarca, dyspnœa connected with disease of the heart, liver, or lungs.

The accoucheur assumes a very grave responsibility in adopting the induction of premature labor as a means of relief in the fifth class of cases, and should always have his own judgment fortified by that of one or more of his professional brothers, for while it cannot be denied that it might occasionally be judicious to perform this operation for any of these cases when there are no other means of relief, and we feel pretty confident in its beneficial results, still its frequent employment must be condemned, because leading to abuse.

Induction of Abortion.—In discussing the question of the induction of premature labor I have employed the term in its limited or technical sense as bearing only upon pregnancy after the viability of the fœtus, but have incidentally remarked that there are cases of extreme pelvic deformity where it would be impossible to deliver a fœtus *per vias naturales* after the age of viability—the only means

of relief being abortion prior to the end of the sixth month of gestation, or the Cæsarean section at term. What can be done in such cases? If we become fully convinced that the Cæsarean section at term, or abortion, is the only alternative, we must, however reluctantly, resort to the production of the latter as giving a better chance for the mother's safety. As the means of producing abortion have already been slightly discussed, and do not materially differ from those applicable to the induction of premature labor, we shall proceed at once to the discussion of the latter.

How to Produce Premature Labor.—Various methods have been recommended and adopted by different practitioners for inducing premature labor; all being intended to call into action the contractile power of the womb. Some of these act through the maternal circulation, primarily upon the spinal cord, such as rue and ergot; others depend upon a reflex action upon the spinal centres by means of irritation of some distant organ, for example, the breast; and others again, upon reflex action generated in or near the womb itself, such as dilatation of the cervix uteri, the vaginal and uterine douche, and rupture of the membranes.

Ergot.—It is useless to fully describe the numerous oxytocics that have from time to time been proposed for the premature expulsion of the fœtus, as most, if not all, of them are unreliable. The most efficient drug of this class is the ergot of rye, although the ergot of corn is considered by a few authorities as equally effective. The former was at one time very popular, and was a great favorite with Ramsbotham, but he finally, owing to the necessity of having to administer it so frequently and largely in almost every case, and to the large fœtal mortality after its administration, ceased to give over a few doses, which if ineffectual were followed by puncture of the bag of waters. That this agent has the power of acting through the spinal cord so as to increase uterine contractions when the latter are called into action by some other means, there is little doubt, but many disbelieve that it can originate contraction in a quiescent uterus. For this reason, and the fact that when largely and frequently administered it often destroys the fœtus in utero, it has been generally rejected as a provocative agent of premature labor.

Krause's Method.—The surest, safest, and quickest method of producing premature labor is to introduce an elastic bougie, or catheter, without a stilet, into the cervix, and gently push it up-

wards for about three and a half inches between the membranes and the uterus. The middle and index fingers of the left hand should guide the instrument to the os uteri. It should be allowed to remain there until uterine pains become fully established. It may be kept in place by tying its lower end to a perineal bandage, or by closing the vulva with a napkin. If possible it should be introduced so as not to rupture the membranes or injure the placenta, for the latter accident might produce severe hemorrhage, and the former by causing the premature escape of the liquor amnii might render the labor more difficult and more dangerous to the child. Sometimes when the membranes are thus accidentally punctured high up, the liquor amnii only passes off by a few drops at every pain, or during the interval between pains. The gradual escape of the waters in this way is looked upon as no disadvantage. Labor pains are provoked by this measure in a few hours at farthest, even in primiparæ, and may be incited in pluriparæ to immediate expulsion of the fœtus.

Barnes's Bags.—Should the above method not produce rapid expulsion of the fœtus, and the emergency be very serious, it might be supplemented by the introduction into the cervix of one

Fig. 129.

of Barnes's bags, and subsequently of a larger one, and so on until a proper dilatation of the cervix and rhythmical contractions of the uterus are produced for rapid expulsion of the fœtus. These bags, as seen in Fig. 129, are fiddle-shaped in order to be the better retained in their place, and are of various dimensions, the smallest being about the size of the little finger, and the largest about two inches in width. They are capable of great distension, which is effected after their introduction, by the injection of air or water by means of a syringe. It is necessary to lubricate the bag with lard, sweet oil or vaseline, and insert a uterine sound into the little pocket on the outside in order to

push it into place. It is supplied with a stopcock to regulate the retention of the fluid. Although these bags are named after the distinguished accoucheur who perfected them, it is an unsettled question who invented them, as it seems that this honor is claimed by Doctors Keiller and Graham Weir, of Edinburgh, Mr. Jardine Murray, of Brighton, and Dr. Barnes. It is highly probable that all these gentlemen, without each other's knowledge, really invented a somewhat similar bag. To Barnes, however, belongs the credit not only of perfecting its shape, but of making the profession fully acquainted with its usefulness. Although the instrument is useful for dilating the os uteri, not only for the induction of premature labor and abortion, but in many other cases at full term of gestation, yet it is by no means as useful and free from objections as Barnes at first believed. He claimed to be able to effect premature labor almost at his pleasure, but after further experience admitted that dilatation by the bags had in some cases to be assisted by some of the other methods of exciting reflex contraction of the womb, especially the introduction of the elastic catheter or bougie according to the plan just stated, or the puncture of the membranes in the manner presently to be described. A very serious objection to the bags is the danger of their displacing the presenting part when the latter is not firmly fixed in the brim, or kept in place by frequent and powerful contractions of the uterus. Where the cervical canal is too small for the introduction of the smallest bag, a preliminary dilatation may be effected by tents of compressed sponge, sea-tangle, or tupelo, in the manner spoken of in a previous chapter. In fact, dilatation in this way will often excite the uterus to expel its contents without the aid of other means.

Puncture of the Membranes.—This was one of the first methods used for inducing premature labor, and was recommended by the council of eminent practitioners who first sanctioned artificial premature labor. It is perfectly sure, moderately safe, and perhaps the simplest and best process for inducing early abortion, but is generally too slow in producing premature labor when the emergency is urgent, and owing to the early escape of the liquor amnii the dilatation of the cervix uteri becomes more tedious, and the powerful contractions of the womb more direct upon and hurtful to the fœtus, so that the life of the latter, and sometimes that of the mother, is more apt to be sacrificed than by Krause's

operation. Moreover, if it should become necessary to turn the fœtus, owing to some mal-presentation or mal-position, which is more common a few weeks or months prior to, than at the full term, the operation would be far more difficult after than before the evacuation of the liquor amnii.

The best instrument for lacerating the membranes is an elastic bougie or catheter, although Simpson's uterine sound or Sims's silver probe, or even a quill will answer very well. Some prefer the catheter to be armed with a stilet for puncturing the membranes after the introduction of the instrument. Some authorities advise the introduction of the latter between the bag of waters and the uterine walls for several inches before puncturing the membranes, as the amniotic sac will then be emptied so slowly that the dangers just alluded to, arising from early and complete evacuation of the bag, will not exist. As a preliminary to puncturing the membranes, many practitioners deem it prudent to follow nature's course of dilating the cervix first. This may be done by inserting in the cervical canal a tent of compressed sponge, or of sea-tangle, or tupelo, in the manner described in a previous chapter, to be followed or not by Barnes's bags, or Molesworth's dilators, as the case may happen to demand.

Injections Between the Uterus and the Ovum.—This is named Cohen's method, and consists in the injection of tepid water through a catheter carried up between the membranes and uterine walls, or a special instrument with a cone-shaped nozzle for dilating the os may be used. The fluid should be injected until the woman feels an increased tension in the uterus. The object of the injection is to detach the membranes from the womb, and thereby quickly rouse the contracting power of the latter. Although this method is sure and quick in its results, it is far more dangerous than the plan first described, and perhaps than any of the operations recommended.

Vaginal Injections.—A vaginal douche at intervals, of warm or cold water, thrown against the os uteri, as recommended by Kiwisch, has met with much favor on account of its simplicity. But aside from its uncertain effects it has often produced death somewhat in the same manner as the previous operation, probably either by a sudden stretching of the uterine walls or a slight rupture of the uterus, thus producing a shock, or passage of the fluid after separation of the membranes through the Fallopian

tubes into the peritoneum, or the entrance of air into the sinuses and thence into the veins.

TARNIER'S METHOD.—"Tarnier's Dilatateur intra-uterin," consists of a rubber tube resembling an elastic catheter, having a thin bladder-like bulb at the upper end. After the instrument is introduced by means of a stilet for several inches between the uterus and membranes, water is forced through the tube until its elastic bulb is considerably distended, when the stilet is withdrawn, leaving the bulb behind. This method will sometimes prove successful, but there are many serious objections to it. If the bulb be injected to the size of a walnut, it will often be expelled without accomplishing its object. If it be distended much larger it will burst, and it is quite as dangerous to both mother and child as intra-uterine injections.

SIMPSON'S METHOD.—Instead of separating the membranes from the uterus by the Cohen or Tarnier method, Sir James Y. Simpson was in the habit of effecting the same object with the uterine sound, which, after having been introduced sufficiently far up towards the fundus uteri, was moved a little from side to side. This plan being somewhat slow and uncertain, he subsequently adopted the method already described of introducing a flexible catheter without the stilet, and of allowing it to remain in the womb until the latter was sufficiently excited to expel the ovum.

OTHER MEANS.—There are a great many other methods recommended for the production of premature labor, such as the use of electricity, galvanism, abdominal friction, the forcible injection of water into the vagina and thence into the uterus, so as to separate the membranes, the administration by the stomach and rectum of powerful drastic cathartics, etc., but none of them are so reliable as the methods described.

PLUGGING OF VAGINA.—Distension of the vagina by tampons made of muslin or cloth of any kind, by cotton, lint, sponge, and rubber balls distended with air or water after introduction, and permitted to remain in the vagina from six to twenty-four hours, have all been used to some advantage in these cases. But the best application of such methods is where flowing is profuse during the process of other plans, when a tampon may be required for the double purpose of checking the hemorrhage and exciting or intensifying the uterine contractions. As an immature child is more difficult to rear than one fully matured, all necessary means should be provided for keeping it alive.

CHAPTER XXXIX.

MANAGEMENT OF THE PUERPERAL WOMAN AND HER INFANT.

UNDER the head of Management of Labor I have already discussed so much of the management of the mother and child as was necessary, until the doctor's first visit to his patient after confinement. In ordinary city practice this visit ought to be made the same day, if the child was born in the morning, or the next day if the birth occurred at night. This rule does not of course hold good in country practice, where distance and other circumstances must be taken into consideration.

AFTER-PAINS.—The routine practice of some obstetricians of administering an opiate immediately after delivery is not to be recommended. They do this to insure good, quiet sleep, which generally comes quite as well if not better without it, unless the patient be annoyed with severe after-pains, when of course an anodyne is highly beneficial. The after-pains generally come on soon after the expulsion of the placenta, and may continue a few hours or for several days. They resemble labor-pains, but are more irregular. As they are generally owing to contractions of the uterus for the expulsion of fluids and coagula from its cavity, they ought not to be looked upon as pathological in character, unless very severe, when they are usually easily relieved by one of the salts of morphia, or some preparation of opium itself, instead of its alkaloids. Where there is loss of sleep, from ten to twenty grains of hydrate of chloral may be combined with the opiate or given alone. When the physician is not within easy call, he should leave a prescription for after-pains before his departure immediately after labor, with directions to the nurse not to administer the medicine unless the pains become very severe. They hardly ever occur in a primiparous woman, but are very common in pluriparæ. They are occasionally of a neuralgic character, when ten-grain doses of sulphate of quinia every morning and evening for a few days, and an occasional dose of morphia between times, will cure them. When the medical attendant is particularly careful, by proper abdominal pressure to cause the womb to

contract well immediately after the third stage of labor, the after-pains are of rare occurrence. Yet this is not always the case, for I once had a patient where this precaution was observed, who suffered terribly from them until I introduced my hand into the uterus and removed an enormous clot of blood which had formed in spite of my efforts to prevent it. This woman sent for me in great haste under the impression that she was in labor with another, or twin, child. After-pains are aggravated, and even produced, by sources of irritation external to the uterus, such as a loaded rectum, or nursing by the infant. The latter cause is very common.

DIET.—It was formerly the universal custom to keep the puerperal woman upon low diet, such as gruels, arrowroot, cracker and tea, and weak broths, for the first four or five days or even longer, under the old antiphlogistic theory of its being necessary in order to ward off inflammation. Although a few physicians, and many old nurses, still cling to this practice, the majority of the most advanced medical men at present permit a much more nutritious and ample diet. In fact, some of them have carried the opposite custom to excess by insisting on their patients being stuffed with rich and highly seasoned food and spirituous liquors. The golden mean in this, as well as in many other things, appears to be the wiser course. When the child is first born, a cup of gruel, milk, beef tea, or a little tea and toast is all that is really necessary for the mother. At her next meal she can have, if she so desires, a boiled or poached egg, or egg and milk beaten up together, or a small piece of chicken, venison, bird, or beef with cracker, toast, or bread and butter; or if very feeble, wine and egg, or eggnog, or a little brown-stout or beer with other fluid. Some physicians, particularly the English, as a routine practice, make their patients drink freely of malt liquors or spirituous fluids during the whole puerperal period. This is generally not only unnecessary, but injurious to the patient, and is apt to engender an appetite for alcoholic stimuli that may lead to ruin of both body and soul. This is no fancy sketch, as many unfortunate women will attest. I am not writing a temperance lecture, but must confess that there is no subject under heaven upon which my convictions are so strong as that of caution in the administration of alcoholic stimulants to patients. Although I am an advocate of a medium supply of food for the lying-in chamber, and opposed to the old starvation or slop

custom, I am equally in opposition to over-feeding, as the patient does not require so much food while lying down as she would when up and attending to household duties. I think that her appetite should be consulted, and that if she either dislikes or craves certain digestible articles she ought to be permitted to have her choice, unless her appetite is depraved or abnormal.

PURGATIVES.—The English physicians are still wedded to the old-time custom of giving a dose of castor oil as a regular practice, about two or three days after confinement. So far as the United States are concerned, it was unnecessary for Professor Barker to throw the weight of his opinion against it, for it has long since been abandoned in favor of more pleasant and less griping cathartics. It is really not necessary to invariably administer purgatives at this period; because most women are aware of the usefulness of having their bowels open at the time of confinement, and usually take something to make them so when otherwise. Under such circumstances it is rarely important to give an aperient prior to the third day, and sometimes not then, if the woman has, in the meantime, had a stool. Occasionally an enema of tepid water, or soap and water, with or without a few tablespoonfuls of olive oil mixed with it, may be more agreeable, and quite as useful to the patient. A Seidlitz powder, or from four to eight ounces of the solution of the citrate of magnesia, or a little senna-tea, or some mild pills or capsules, charged chiefly with rhubarb, but made more active by the addition of a little podophyllin, or some of the pleasant cathartic elixirs manufactured now-a days by our pharmacists, may be all that is needed. I have often found the fluid extract of senna and jalap, combined with Murray's liquid magnesia, to act very satisfactorily, especially in women of naturally costive habits. Where there is an accumulation of hardened fæces, the best remedy is sulphate of magnesia, dissolved in some pleasant menstruum, like orange-peel or orange-flower syrup, or lemon syrup.

[Castor oil, as prepared free from the resin of the bean-hull, and without heat, is colorless, inodorous, almost devoid of taste, and does not gripe. When made into an emulsion with sarsaparilla syrup and soda-water, but three or four fluid drachms are required for a dose. This is a favorite laxative, both for taste and effect, in our large cities.—EDITOR.]

IMPORTANCE OF REST IN BED.—While many practitioners, espe-

cially in England, France, and some portions of the United States, advise confinement to bed for two or three weeks after labor, another class of extremists insist upon the patient sitting up out of bed as soon as the baby is born, in order to have her bed made up; and so on for a little while daily, until the sixth or seventh day, when she is permitted to remain out of bed all day if she desires. The safer plan is, to keep the woman in bed for about a week, when, if she is doing well, and there is no special reason for longer continuous rest in a horizontal posture, to permit her to sit up a little while every day, or lounge upon a sofa while her bed is being freshened. The period of being out of bed may gradually be lengthened until the ninth or twelfth day, depending upon circumstances, when she may remain out of bed all day. She should not be permitted to leave the room for several days afterwards, or the house for two or three weeks. There are special cases where it becomes necessary to confine the woman more or less strictly to the horizontal position for a much longer period than the one just stated.

Bladder.—There is often great sluggishness in the action of the bladder for a short while after parturition, and sometimes it is in a condition of atony, or temporarily paralyzed, so that the patient cannot urinate. In the latter event, it becomes necessary for the accoucheur to draw off the urine two or three times daily, until the organ regains its normal power of contraction. True paralysis, however, is rare; but it is by no means uncommon for the woman to have more or less difficulty in evacuating this viscus, especially when the nurse has neglected to have her try at a proper time after confinement. It is the duty of the medical attendant to prompt the nurse in regard to this point, prior to his departure after labor. He should instruct her not to let the woman go over eight hours without making an effort to urinate, and that the effort must be renewed about every three hours until she succeeds. She may be assisted, if necessary, by warm fomentations, or even a warm sponge applied to the hypogastrium and pudenda, or by laving the latter with warm water. I have occasionally known the pouring of a stream of tepid water over the meatus urinarius to succeed when other simple means have failed. Occasionally there is a woman who cannot make water in a urinal, bed-pan, or any other vessel while in the horizontal position. In such cases, it is better to let her sit up in bed, on some suitable vessel, or she may

be requested to lean forward upon her knees. Even where there is no trouble in urinating, it is better that she should assume the latter position, after the second day, whenever she desires to make water; for, besides facilitating this process, it enables the womb and vagina to expel all retained fluid or coagula. The fluid extract of ergot, in a few twenty-minim doses, at intervals of an hour, is said, by Playfair, to be occasionally successful in cases of retention of urine, depending upon temporary paralysis.

The Lochia.—The discharge which escapes from the vagina after confinement is called the lochia, which is at first almost pure blood, and comes from the denuded walls of the uterus. Portions of it occasionally coagulate into clots, which cause more or less pain in their expulsion from the womb. The distinctly sanguineous character of the discharge disappears in a few days, and it gradually assumes a greenish-brown, or dirty-brown color, and becomes more and more scanty until its final cessation. The lochial discharge lasts longer in some women than in others, but ordinarily stops in two or three weeks. After losing its bloody appearance, it may assume it again from physical excitement. If the discharge disappears very soon after labor, it is commonly a sign of some puerperal trouble, except after the birth of a stillborn child, when it may cease even in two or three days without creating any anxiety. No treatment is required for the lochial discharge, unless it should be entirely too scanty or profuse, or be very fetid. When too scanty, an occasional warm-water injection *per vaginam* may be useful. If too abundant, an astringent may be added to the injection; and, if very fetid, about a tablespoonful of carbolic acid, or of the solution of chlorinated soda, or a drachm of the permanganate of potassa may be mixed or dissolved in each pint of the vaginal wash.

Vaginal Washes.—Even where there is no bad odor to the discharge, it is good practice to have the vagina gently syringed out every day, after the first forty-eight hours, with tepid water. Previous to this time the os uteri is so patulous that an injection might occasionally produce some uterine trouble, especially if injected carelessly by an ignorant nurse. The vulva should be washed once or twice daily with warm water, to which may be added a few drops of carbolic acid, a little Condy's fluid, or salicylic acid, or Labarraque's solution of chlorinated soda, or simply

a little bay rum or brandy. Occasionally a little castile, carbolic, or glycerine soap may be mixed with the water.

Bandage.—The abdominal bandage, applied as directed in a previous chapter, should be frequently readjusted and renewed by the nurse. It should be neither very loose nor very tight, and not be allowed to gather up into a string, but be kept in place. It may be permanently removed in the course of two or three weeks.

Involution of the Uterus.—If the involution of the uterus is not arrested or retarded, this organ gradually diminishes in weight from about twenty-three ounces, immediately after delivery, to about six ounces at the expiration of three weeks, but it does not reach its normal weight until the end of the second month. The uterus is plainly felt in the hypogastric region during the first puerperal week, but settles below the brim in a short time thereafter, so as to be no longer made out by palpation over the abdomen in twelve days subsequent to labor.

Milk.—Some women have their breasts distended with milk when the child is born, but generally this important secretion is not fully established until the second or third day after labor. If it should then come suddenly in great quantity, the breasts not only become distended with milk, but engorged from the great rush of blood to these glands, causing heat, pain, and swelling, and sometimes more or less constitutional disturbance. The latter is apt to be ushered in by a chill, followed by a moderate fever, formerly termed milk fever, ephemera or weed, but now believed by many to be the result of an absorption of septic matter into the blood and having no connection with the lacteal secretion, except that of occasional coincidence. Barker, for example, asserts that in fifty-two observations at the time of the first secretion of milk he noted an increase of pulse or temperature in only four cases. On the other hand, Macan found an elevation of temperature to 100° and over, in two hundred and twenty-six out of four hundred and twenty-three cases. I believe the latter observation to be more in accordance with the common experience of medical men. Several modern writers who deny the existence of milk fever are probably as much in error as the older authorities, who attributed too much importance to it. Mere theorists may argue as they please, the mass of intelligent practitioners who are in the habit of observing the close connection between turgid and painful mammæ, and the accompanying discomfort and warmth of the general system,

and the relief that always succeeds the emptying of the breasts, will be loth to deny the occasional existence of milk fever. The mere coincidence of septicæmia cannot satisfactorily explain all these examples. The first milk secreted differs somewhat from that which follows, and is named *colostrum*. It is thinner, more watery, and contains less casein than the after-coming milk, and acts as a natural aperient to the child, cleansing its bowels from that black-looking secretion formed in them during intra-uterine life, called *meconium*.

Galactorrhœa and Agalactia.—An excessive secretion of milk is known as *galactorrhœa ;* a deficient secretion as *agalactia*. The treatment of the former consists chiefly in a proper regulation of the diet, depending somewhat upon whether the milk is both excessive and rich, or excessive and watery. A few large doses of iodide of potassium have also been found useful. Agalactia must be reached as far as possible by an allowance of abundance of good wholesome food, especially large quantities of milk. Fomentations with the castor oil plant, and the use of cotton-plant leaf tea as a drink, have been found useful in exciting the secretion of the breasts.

Mammary Abscess.—The breasts are liable to become inflamed during lactation. The inflammation rarely attacks more than one breast, and may occur at any period, but is more common in the early months of nursing. It may be quite superficial and circumscribed, or very deep-seated, and involve a part or the whole glandular structure of the mamma. The inflammation may subside without the formation of pus, but is very apt to terminate in suppuration or abscess.

Causes.—Inflammation of the mamma arises most frequently from fissures and erosions of the nipples, but is often produced by an engorgement of the lacteal tubes from neglect on the part of the nurse or mother in not having the milk sufficiently drawn by the child, or some substitute in the event of the latter not doing the same. It may, however, originate from cold, sudden mental emotions, especially of a depressing character, or from injury.

Symptoms.—As we would naturally suppose, the symptoms vary, especially in degree, according to the seat and extent of the inflammation. If this is located in the subcutaneous areolar tissue only, the pain, heat, and swelling are moderate, and if suppuration occurs, the abscess breaks through the skin in a few days and heals up in

two or three weeks, without, in some instances, preventing the process of lactation, and even without treatment. The symptoms are very different when the interlobular and subglandular cellular tissue, and the milk-ducts, and lobules are inflamed. Under these circumstances the inflammation is very apt to be ushered in by rigors, followed by fever, and accompanied by lancinating pain and great tenderness of the mamma in circumscribed places, which are hard to the touch and swollen. The inflammation may even in these severe cases disappear by the process of resolution, but more commonly terminates in suppuration, preceded by further rigors. The hardness of the tumefaction now gives place to softness, and if near enough to the surface, to fluctuation, the pain and swelling continue, and as the pus approaches the surface the skin over it becomes hot, red, and finally glazed or shiny.

Where the abscess is very deep the cutaneous surface often assumes an œdematous appearance. While suppuration is going on the general symptoms of fever, loss of appetite and debility, continue, except that the fever remits once or twice daily, and gives place to profuse perspiration. If unrelieved by treatment, or the abscess is not opened, the pus finally makes its way to the surface by bursting the thinned walls of the breast, most usually somewhat in the vicinity of the nipple. Unless the entire breast be involved, the secretion of milk may continue in the unaffected part to a certain extent. It is rarely prudent, however, to let it be drawn by the baby, as it is apt to render the latter sick, besides nursing under these circumstances is perfect torture to the poor mother. The best plan is to let the breast dry up, and nurse the baby altogether from the well one.

Should the woman have another child the inflamed breast will do duty again, but somewhat more imperfectly, and with an acquired predisposition to inflammation. Inflammation and abscess of the breast, even when of the severer grade just described, generally gets well in a month, or month and a half, but sometimes, particularly if there is a scrofulous predisposition on the part of the mother, continues much longer. In fact, the subglandular variety, or that seated chiefly in the areolar tissue between the mammary gland and the wall of the chest, may continue from two weeks to as many months before suppuration commences, and several months subsequently before completely healing; and this too in spite of repeated lancing and other treatment. Such cases try

the doctor's patience; for, do what he will, he is always more sure of blame than pay. If he lances the breast he will be censured for either opening it too soon or too late, according to the prevailing views of the old gossips of the neighborhood. Fortunately for the reputation of the physician, these subglandular abscesses are extremely rare.

Treatment.—Much may be done by way of prevention of inflammation of the mammæ by curing so soon as possible chaps and excoriations of the nipples, when existing, and by careful attention to the emptying of the breasts at proper intervals in order to avoid congestion or engorgement of the galactophorous tubes. The treatment of the nipples will be noticed further on.

Emptying the Breasts, Embrocations, and Fomentations.—The best thing to prevent engorgement is regular nursing by the infant. If for any reason this should fail, the breasts should be drawn by a young puppy, the nurse, or, if nothing else proves available, by a breast pump. If actual engorgement exists, called caking by some nurses, besides thus relieving the over-distended organs or organ, for generally only one at a time is badly affected, it may be gently rubbed with warm sweet oil, lard, spirits, or camphorated oil, the friction to be from base to nipple, and by no means hard. Neither should the oil or other applications be too hot. If not looked to, old nurses are very apt to go to extremes on these points. When actual inflammation exists these means, together with saline aperients, fever mixtures of citrate of potassa and spirit of nitrous ether, and probably a good dose of sulphate of quinine every morning and night, will cause an abortion or resolution of the inflammation in a few days. Warm fomentations of almost any kind, such as cloths wrung out of warm milk, decoction of chamomile, poppy flowers, or hops may be highly beneficial. The old practice of applying leeches has pretty well gone out of fashion.

Ice Bags.—Instead of warm soothing applications a few physicians advocate the use of refrigerant lotions or ice bags to the inflamed breast. Dr. W. Goodell, at the stated meeting of the Obstetric Society of Philadelphia, November 4th, 1880, read a paper from Dr. Hiram Corson upon the treatment of mammary abscess by ice broken up and placed in a bladder, with just enough water to float it, and applied to the breast with only a single thickness of muslin intervening. Dr. Corson, after an experience

of twenty-seven years, claims great success from this treatment, especially in the early stages of inflammation of the mammæ; although he considers it useful in allaying the inflammatory symptoms after the occurrence of suppuration.

Poultices.—Although Dr. Corson objects to poultices in the treatment of inflammation of the breast, the almost universal custom of physicians is to use them after suppuration has taken place; and many apply them in the preliminary stages of engorgement and inflammation. They may be made of bread-crumbs and milk, of ground flaxseed, marshmallow, slippery elm, singly or combined, with an admixture of chamomile, hops, poppy flowers, laudanum, glycerine, sweet oil, lard, or similar articles.

Lancing.—Nearly all medical men agree that after suppuration occurs the breast should be lanced; but while some would open the abscess as soon as formed, others advise delay until the pus makes its way pretty close to the cutaneous surface. Dr. Playfair recommends the removal of the pus as soon as possible. Some authorities think the best plan to give exit to the pus in deep-seated abscesses is by an exploring needle. I prefer for this purpose a sharp bistoury.

Playfair strongly insists on the use of antiseptic precautions, after the method of Lister, in all cases of puncturing the breast. Sometimes it becomes necessary to lance the breast repeatedly, in order to drain the various sinuses containing purulent matter. The effect upon the general system is occasionally so debilitating in cases of long-continued suppuration of the mamma that a tonic course of medicine and regimen becomes imperative. Under these circumstances iron and quinine, and abundance of good nourishing food, will afford great relief.

Sore Nipples.—As excoriations and fissures of the nipples are exceedingly distressing to the mother and often lead to inflammation and abscess of the breast they are deserving of the attention of the medical attendant. Sore nipples generally make their appearance after a few days' suckling. They are most common with women after their first children, but some rarely escape the disease during the whole period of lactation. There is a close relation between aphthæ of the child's mouth and sore nipples, as they are frequent concomitants. A repeated application of the infant to the breast is a common cause of this affection, which manifests itself in the form of a simple abrasion or crack on the surface of the

nipple, degenerating sometimes into a small ulcer, and causing intense pain whenever the child nurses.

TREATMENT.—This resolves itself into prophylactic and curative. The former consists in preparing the nipples for nursing by the use of a spirituous or astringent lotion several times daily during the last few weeks of gestation, such as a weak solution, or glycerate of tannin or alum, or a little brandy. Similar washes are also useful after the nipples have become sore. A solution of borax in rose-water and glycerine is also very healing to them. Cauterization of the ulcers by nitrate of silver is a favorite remedy of some practitioners. Ointments made of borax, salicylic acid, or boracic acid or tannin, and simple cerate, lard, or vaseline may be found serviceable. As one great obstacle to the healing process is the suckling and biting of the child, the nipple may be protected during the act by one of the numerous nipple-shields invented for this purpose. Unfortunately the child can rarely be induced to nurse properly through it. Various other substances besides those already mentioned may be made into the form of ointments or lotions, such as acetate or nitrate of lead or zinc, or sulphate of zinc combined with cosmoline or glycerine, and applied to the nipples after every nursing, and washed off again prior to the application of the child.

ATTENTIONS TO THE CHILD.—Having in chapter twenty-four described the manner of treating the new-born child when in a state of suspended animation, the methods of tying and dressing the cord, and of washing the infant, we shall now allude to a few more points in the management of the infant.

NURSING.—So soon as the mother has had a few hours' rest after confinement the baby should be applied to the breast. It should not be permitted to nurse more than twice a day until the flow of milk has been fully established, after which time it may be allowed to do so about every two hours for a few weeks, then every three hours, and when several months old, every three or four hours during the day and every five or six hours at night, thus giving the mother a better chance to sleep, which is of the greatest importance, not only to herself, but indirectly to her infant, for if the latter be allowed to take the breast every time it cries, the mother will soon become so worn out and exhausted that the milk would become unwholesome. Besides moderate intervals are necessary for a proper digestion on the part of the child.

Nurses do not like to be interfered with by the doctor, and if permitted to have their own way will often sadly mismanage the child by either withholding it altogether from the breast and drugging it until lactation is fully established, or allowing it to drag upon the nipples too often and make them sore. The first milk is necessary for the infant in order, as already stated, to cleanse its bowels of meconium, and is far better than castor or sweet oil, or other aperients. Early nursing has the additional advantage of assisting by reflex action in contraction of the uterus to expel clots, prevent hemorrhage, as well as to prevent the infant from losing its instinct for nursing, which it sometimes does under the circumstances, especially if artificially fed. If it fails to get any milk from the mother at this early period, it should be fed with a little tepid fresh cow's milk diluted with an equal quantity of water and slightly sweetened with loaf sugar. As a rule the mother has sufficient milk for the child until it is five or six months old, when it may be allowed an occasional meal of some artificial food. If the mother's milk fails entirely, or proves to be insufficient for the proper sustenance of her infant, slightly sweetened tepid cow's milk, diluted at first with an equal quantity of water, but finally used pure, should be allowed the child as a substitute, provided it be undesirable or impossible to secure a good healthy wet-nurse. In selecting the latter it is not only important to see that she is perfectly healthy, but that her milk is neither too old nor too young for the child, and that her habits of eating and drinking are such as to insure wholesome milk. It is a great mistake to encourage the person furnishing the milk, whether the mother or a wet-nurse, to over-feed and drink. In short, where her appetite and strength are good, there is no necessity of encouraging her to eat too freely of very rich and stimulating food, or of partaking freely of spirituous or malt liquors. Such a habit is baneful alike to nurse and baby.

Other things being favorable it is better for the mother to nurse her own child, as during the first few weeks the act assists in the proper involution of the uterus, and she can generally feel more confidence in the purity of her milk. If, on the contrary, she has insufficient, or her constitution is tainted with syphilis, or a strumous cachexia, she had better employ a wet-nurse, or bring the child up on artificial food as before directed. When brought up on the bottle or by hand, cow's, goat's, or ass's milk is best for the first few months, when some of the preparations of farina-

ceous foods may be gradually added, as well as chicken, mutton, or beef tea, with or without crackers. Barley-water is very useful, and in cases of diarrhœa or inflammation of the bowels may sometimes be given exclusively for awhile. Such preparations as Liebig's Infant Food, and Hards' Farinaceous Food may occasionally be advantageously used. Arrow-root and other exclusively starchy articles of diet, so fashionable twenty years ago, are no longer recommended, except under rare conditions.

Period of Weaning.—Where the mother's health will permit prolonged lactation, it is better not to wean the infant until after the second summer, especially in our large cities, where cholera infantum and other intestinal affections are so prevalent. Aside from being protective against these very serious ailments lactation is more or less of a safeguard against frequent childbearing. Still there are but few women who can or will nurse their offspring longer than a year. The method of weaning is very simple. Having for some weeks, or months, when practicable, prepared the infant for the change by a gradual adaptation to artificial food; rub a little tincture of aloes, quassia, or assafœtida around the nipples just prior to putting it to the breast, and it will soon relinquish its accustomed beverage with disgust. Something must then be done to restrain an overdistension of the breasts from milk, or engorgement and inflammation may succeed. This can be done by giving the woman twenty grains of iodide of potassium, morning and evening, for a couple of days, at the same time having the breasts gently rubbed with warm camphorated oil, brandy, sweet oil or lard when disposed to "cake," and of drawing out a little milk with the breast-pump when they are over-distended. Some physicians have great faith in the application of belladonna plasters, but as they cause pain when the mammæ become much distended, owing to the unyielding nature of the leather upon which the belladonna is spread, it is perhaps preferable to apply the latter in the form of a mixture or ointment of one drachm of the extract to one ounce of glycerine, fresh lard, or vaseline spread upon strips of muslin. Belladonna is however a very uncertain, and sometimes when there are abrasions on the breasts, dangerous application. Lint or cotton-wool soaked in warm bay rum or bay water, laid over the breasts and covered with oiled silk is often beneficial. There are many other interesting things in relation to the management of the mother and child, that would receive attention did space permit.

CHAPTER XL.

PHLEGMASIA DOLENS.

Few diseases have so many names as the one now to be considered. It is called *œdema lacteum*, *anasarca serosa*, *white leg*, *milk-leg*, *crural phlebitis*, and *peripheral venous thrombosis*, according to the various theories of its essential pathology. Its most familiar names in this country are *phlegmasia dolens* and *milk leg*.

Its Association with the Puerperal State.—Although it is generally associated with the puerperal state it is by no means essential to it, but may occur in the course of pregnancy or any time during lactation, and has in rare instances manifested itself in single women, and in men.

Complication with Albuminuria.—As there is no allusion by authors to its occasional complication in the recently delivered woman with albuminuria, I never deemed it of importance to examine the urine for albumen, until a few years ago in a patient taken sick with phlegmasia dolens of the left leg seven days after labor. About the third day of the disease, when the swelling and tension of the limb were at their height, I found the urine loaded with albumen, which disappeared entirely under proper treatment, as the swelling commenced to abate. The patient, a primipara, had a hard and tedious labor. There was no mistake in the diagnosis, as the phlegmasia dolens was of a regular, typical character. She made an average recovery. In answer to her inquiry as to whether she would have the milk-leg after her next confinement, I told her that she might, and that some pathologists were of the opinion that a woman once having had the disease, was more liable for that very reason to subsequent attacks

Its Site.—Most frequently it appears in the left lower extremity; the next most frequently in the right, then in both legs simultaneously or successively, and most rarely in the arms.

Pathology.—Phlegmasia dolens, like puerperal fever, has given rise to a great difference of opinion in regard to its essential pathology, as may be inferred from its numerous synonymes. Mau-

riceau thought it to be caused "by a reflex on the parts of certain humors which ought to have been evacuated by the lochia."

Another author considered it to be owing to an effusion in the parts, of milk, hence the name "milk-leg." Even Puzos and Levret supported this absurd theory. We next find the theory of Mr. White, of Manchester, ascribing its dependence on obstruction, or some other diseased state, of the glands and lymphatics of the affected part. Dr. Davis, of University College, M. Bouillard, and Dr. Lee believed that its essential pathology consisted in thrombosis of one or more of the following veins: the iliac, crural, saphena, vaginal, and occasionally the vena cava, as the result of inflammation extending from the uterine veins. Hence the name it still bears with many medical men, "crural phlebitis." Virchow concurred in this opinion, but was one of the first to assert that thrombosis is not necessarily preceded, but may be succeeded, by inflammation of the venous coats, which opinion is at present generally accepted.

The latest theory is that of Dr. Tilbury Fox, who claims that its leading phenomenon is not phlebitis, though the latter may be associated with it, but an obstruction to the return of blood and lymph from the diseased parts, and divides the causes of such impediment, so far as the vessels are concerned, under "*extrinsic* and *intrinsic*." The *former* embracing pressure from tumors and the like; the *latter*, acting by producing coagulation, are:

1st. Phlebitis, septic or non-septic.

2d. Introduction of morbid matter into the veins, producing simple thrombus, but not phlebitis.

3d. Preternatural coagulability of the fibrine of the blood.

Dr. Fox's theory may be the better understood by the following propositions extracted from his valuable paper upon the subject.

"*Proposition* 1. In phlegmasia dolens both veins and lymphatics are obstructed.

"*Prop.* 2. The obstruction may be due simply to extrinsic pressure.

"*Prop.* 3. Or to inflammatory changes in the coats of the vessels, leading to coagulation (this depends upon virus action), except during epidemics of puerperal fever; this is not so common as supposed.

"*Prop.* 4. It is pretty well admitted that rapid ingress of abnormal fluid, suddenly and in large amount, will cause instanta-

neous coagulation of the blood; and it is also admitted that large drains from the system are followed by rapid and compensating absorption. There is good reason for believing that these conditions are fulfilled in a perfect and ample degree, in conjunction with the presence of wound—facilitating absorption—in a great many cases prior to the occurrence of phlegmasia dolens, and that the latter is frequently thus involved.

"*Prop.* 5. These different modes of evolution may be more or less conjoined."

Symptoms.—The phenomena of a typical case of phlegmasia dolens when fully developed usually point with clearness to the nature of the disease; but this is not always so in mild or irregular cases, which, prior to the swelling, may be mistaken for neuralgia, and afterwards for simple œdema. An ordinary case is generally ushered in with a slight fever, sometimes preceded by a rigor. The patient feels irritable, depressed, and restless, and may complain of pain in her groin, hip, thigh, knee, ankle, or calf, generally in the latter. Occasionally the pain is very severe from the beginning. It is more or less present during the whole attack, but has spells of exacerbation, and abates when the swelling begins to decrease. Generally within thirty hours from its commencement the affected part begins to swell, and soon becomes very large, tense, shiny, and white. The swelling seldom pits when at its height, but generally does at the beginning and towards the ending. It usually commences in the groin and thigh, and spreads downwards, but sometimes begins in the calf and runs in both directions, until it involves the entire limb, which soon becomes more or less paralyzed and helpless. It may increase to double its natural size. When the part is thus enormously swollen, it feels to the patient, except in the matter of pain, somewhat like a wooden leg. The femoral, saphena and popliteal veins sometimes feel hard, and roll under the finger like cords. They may feel tender, and present slight redness in their course, but the swollen limb is red nowhere else, but is waxy and white. The pulse and temperature vary with the progress of the disease; the former being weak and about 120 per minute; the latter, about 101° or 102°, with an evening exacerbation. There is generally much thirst, especially when the fever is high. The appetite is poor; the bowels are usually constipated; the tongue covered with a white coat, or glazed. The disease usually comes on in the

second week after confinement, but may make its appearance at any time during the puerperal period, and even under other exceptional conditions, as before stated. If it spreads to the sound limb there is apt to be an increase of fever, with a repetition in the newly diseased part of all the phenomena presented in the limb first affected. The pain is greatly augmented by hanging the limb down, and, in my experience, the swelling too, though Meadows and other authors assert the contrary. There may be an improvement in the disease in a few days, or not for several weeks. Generally, in about ten or twelve days the swelling and tension begin to subside, the temperature and pulse to fall, the restlessness and sleeplessness to diminish, the pain to abate, the thirst to disappear, and the appetite to improve.

The swelling may disappear by absorption in a few weeks, but may not for as many months. The limb rarely suppurates, when it does, the duration of the complaint is greatly prolonged. Although ultimate recovery can nearly always be predicted, even after a long period of ill-health, the malady may terminate in death. This sometimes comes on suddenly from a detached portion of the coagulum, which plugged up the vein in the leg, being carried to the right side of the heart, or to the pulmonary artery, and rapidly increasing in size from new deposits of fibrinous material, and thus stopping the circulation. Death may, however, proceed from exhaustion, arising from the violence of the constitutional disturbance, or suppuration, or from gangrene.

Treatment.—Under the old antiphlogistic plan of treatment it was generally considered necessary to bleed the patient from the arm, and locally by leeches; to administer fever mixtures largely composed of tartar emetic; to purge freely, especially with calomel, or salivate with some mercurial preparation; to blister repeatedly, and use violent friction with powerful liniments, and to put the patient upon starvation diet. There are not many physicians of the present day who would adopt the above treatment, although there are a few who bleed from the arm, use calomel, or keep the patient on extremely low diet as a matter of choice. We do not consider that there is any specific or abortive treatment for the disease, but place most reliance on rest, anodynes, tonics, and supporting diet. We would purge, but not with calomel. A mild dose of the solution of the citrate of magnesia, rochelle salts, fluid extract of senna combined with syrup of rhubarb, fluid extract of senna and jalap, Murray's liquid magnesia, or a mixture

of podophyllin, rhubarb, and compound extract of colocynth, or one or two Seidlitz powders might be given, as occasion required. In lieu of medicine by the mouth, an enema of soap and water, with or without a few tablespoonfuls of sweet oil, might occasionally be found useful. Anodynes and soporifics are always of service. One of the salts of morphia alone, or in combination with chloral, will generally answer the purpose. The former may often have the best effect when used hypodermically.

Local Treatment.—The limb should be kept at rest in an easy elevated or horizontal position upon a pillow, and wrapped with cloths wrung out in warm anodyne fomentations of the decoction of hops or poppy flowers, or with poultices of slippery elm, marshmallow, flaxseed-meal, bread, separate, or mixed with a little powdered opium, tincture of opium, tincture of belladonna, or fluid extract of the latter, sprinkled upon the surface. A strip of oiled silk should cover the application. In addition to the above, or in their stead, warm, soothing embrocations may be gently applied to the limb, or a stupe of oil of turpentine and sweet oil; but no rough friction should be allowed, on account of the danger of detaching into the circulation portions of the clot or coagulum, and thus producing death from embolism of the right side of the heart, or of the pulmonary artery, or one of its principal branches. Let him who fancies that there is no such risk read the graphic description given by Trousseau of M. Demarquay's experience. It may be proper to state here that the only safe way for the thrombi or plugs to disappear is by absorption, which is a slow process, not susceptible of being hurried by rough manipulation. This must be borne in mind, especially during the period of subsidence of the swelling, when embrocations and flannel bandages should be applied to the limb, instead of poultices, for the nurse, if not otherwise instructed, is almost sure to use undue and dangerous friction in the application of the embrocations. The latter may consist of one part of the compound tincture of iodine to eight parts of glycerine, or equal parts of soap liniment and sweet oil, gently applied every morning and evening prior to bandaging the entire limb with flannel. The application of electricity, and of douches of warm salt water, to the limb, is recommended as useful in hastening absorption and restoring the limb to its normal size and strength. These remedies should be tried only after the acute symptoms have subsided.

A framework of wire should protect the limb from undue pressure of the bedclothes, and from other disturbances. If at any time during the existence of phlegmasia dolens the lochia become offensive, vaginal injections of about two teaspoonfuls of the solution of chlorinated soda, or one teaspoonful of carbolic acid to the quart of tepid water, will be found useful.

Constitutional Treatment.—In order to neutralize any septic materials that may be in the blood, Dr. McKenzie has recommended the use of either the carbonate of ammonia or diluted hydrochloric acid. As tonics we would administer one or more of the numerous preparations of Peruvian bark and iron. Sulphate of quinine and the tincture of the chloride of iron, either separately or in combination, will often be found highly useful; so will dialyzed iron, or Vallet's ferruginous pills. As the stomach often rejects all disagreeable medicines, it may become necessary to resort to some of the numerous elegant pharmaceutical preparations of iron, cinchona, pepsin, bismuth, and maltine, manufactured by such chemists as Wyeth & Bro., or Reed, and Carnrick, and others.

Diet.—There should be no attempt at either placing the patient upon very low diet, or of going to the opposite extreme of forcing her to swallow all kinds of rich foods and stimulating drinks During the acute stage of the disease her appetite is apt to be very feeble and somewhat capricious. She should then be allowed toast and tea, milk, chicken, mutton or beef tea, or the essence of beef, wine-jelly, ice-cream, and other digestible food. If she craves eggs, quail, young pigeons, snipe, venison, or trout, there is no reason why she may not as a rule be allowed a moderate quantity. This kind of food is, however, more adapted to the convalescent stage of the complaint. As to wine and milk, or wine and egg, or egg-nog, I believe the patient can nearly, if not always, do without. If, however, she has been accustomed to alcoholic stimulants when in health, there may be an occasional necessity of their allowance in sickness.

CHAPTER XLI.

SUDDEN DEATH IN THE PUERPERAL STATE.

This highly interesting subject requires for its elucidation far more space than can be devoted to it in an elementary work on obstetrics. The older authors have very little to say about it, being content to refer such cases to the entrance of air into the veins, shock, exhaustion, or syncope. Modern writers and practitioners may generally be found in the opposite extreme, and attribute the causes of nearly all sudden deaths in puerperal women to thrombosis or embolism, of which our forefathers were ignorant.

Thrombosis and Embolism.—Although the advanced student ought to be conversant with these comparatively modern terms, as they appear in other branches of medicine than obstetrics, yet a few words by way of explanation may be advantageous to him. The former word, according to the general usage, has already been applied in this book to a formidable obstruction of labor, consisting essentially in an extravasation of blood in the vulva and around the vagina, from rupture of varicose veins, where, if it does not escape externally, or is not removed, it forms a clot or coagulum called a thrombus. The term is in this instance used synonymously with hæmatocele. This is unfortunate, as it leads to confusion. The true thrombosis now under consideration is a very different thing. It is a coagulation of blood during life in a vein, artery, or the heart.

Thrombosis and Embolism of the Venous Circulation.—By embolism is meant a plugging of those parts by a clot or solid mass coming in the circulation from a distance. For example, in the pathology of phlegmasia dolens we alluded to thrombosis of the femoral and other veins, and under the head of treatment spoke of the danger of rough manipulation producing a detachment of a portion or of all the clot, and of its conveyance to the right side of the heart, or to the pulmonary artery, or one of its branches, and there forming an embolus or nucleus of one, and resulting in death more or less sudden, according to the site of its lodgement

and the completeness of its obstruction to the circulation of the blood.

Thrombosis and Embolism of the Arterial System.—Any part of the arterial system may also become obstructed by a thrombus, or by an embolus. The latter is formed from a part or the whole of a clot of blood, or fragment of fibrine conveyed in the circulation from a distance, most generally from the left side of the heart. When from the latter, it is usually a fragment of vegetations from the mitral valve, the result of rheumatic or puerperal endo-carditis.

Causes of Thrombosis.—It was at one time supposed that inflammation of the vascular coats was essential to the production of thrombosis. It is now known that although frequently coincident with inflammation, it may sometimes be the cause, and sometimes the effect, of the latter. The pathological conditions of the inner coats of arteries productive of it are arteritis, atheroma, syphilis, and calcification. Septic matter in the blood, especially resulting from puerperal pyæmia and septicæmia, may be an active agent in its production both in veins and arteries. Anything that will cause a sluggish movement or stagnation of the blood in the venous or arterial circulation—as external pressure, for instance—may produce it, especially when the blood contains an excessive proportion of fibrine, as is the case in the pregnant and puerperal states. Excessive hemorrhage also leads to it.

Results of Thrombosis and Embolism.—The dangerous results of venous thrombosis and embolism are apt to be from obstruction of the circulation in the right side of the heart, or in the pulmonary artery or its branches; while arterial thrombosis and embolism will be manifested in the peripheral arterial system by a stoppage of the circulation in the arm or leg, resulting generally in mortification of the distal extremity of the same, or in an obstruction of the circulation of some one of the viscera—like the kidney or liver, but more usually in an obstruction of one of the carotid or cerebral arteries—especially of the left cerebral. Of course, death is sudden when the obstruction is complete in the heart or pulmonary artery, no matter whether from a thrombus or embolus. It is not so sudden or so certain from a clot or plug in the brain, but will produce aphasia, hemiplegia, and softening, which may terminate in death. A thrombus or embolus in other organs is apt to produce inflammation, which may or may not terminate in abscess, but rarely in death.

Clots in the Right Side of the Heart.—Most authorities deny the possibility of thrombosis of the right side of the heart, and affirm that a clot found there must necessarily be an embolus in part at least, having a fragment of a distant thrombus for its basis. On the other hand, Playfair and others maintain that a heart-clot may be either a thrombus or embolus.

Symptoms of Thrombosis and Embolism.—Of course, the symptoms of obstruction of the circulation are practically the same in both thrombosis and embolism, and vary in character according to the nature, site, and degree of obstruction. We have no space for a description of the phenomena of such obstruction when affecting any of the minor parts of the body, because it is foreign to the scope of our subject—sudden death—and shall confine ourselves to a synopsis of the symptoms of pulmonary and cerebral obstruction. We shall also omit an account of the symptoms of obstruction of the right side of the heart, because of their similarity to those of obstruction of the pulmonary artery.

Phenomena of Pulmonary Obstruction.—Leaving out of consideration the smaller branches of the pulmonary artery, we shall describe only the thrombotic and embolic obstructions of the main trunk and principal branches. The symptoms are essentially the same in thrombosis and embolism, and their gravity is graduated by the degree and location of the clot. If the latter almost completely stops the circulation of the primitive pulmonary artery, death supervenes immediately. If considerable space remains around the same for passage of the blood, the symptoms will be grave, but not always mortal. In case the obstruction is in only one of the chief branches, death may occur suddenly, but may not at all. In the very worst cases death is sometimes so sudden as to prevent any appreciable symptoms. The latter, when observable, will consist in extreme dyspnœa, a terrible gasping and struggling for breath, a tumultuous and irregular action of the heart, small pulse, and either a livid or pale countenance, and a coldness of the surface of the body. The pulse becomes more and more feeble and fluttering, the respiration shorter and more rapid, the patient more and more anxious, until death closes the distressing scene. The patient retains her consciousness to the last. In the very few cases of obstruction of the pulmonary artery or one of its chief branches, where death does not occur, the clot allows considerable blood to pass by it, until it disappears by absorption. Obstructions

to the smaller arteries of the lungs, though rarely resulting in sudden death, may ultimately prove fatal from supervening pneumonia, circumscribed abscess, or pulmonary apoplexy.

Symptoms of Cerebral Thrombosis or Embolism.—Death from a clot or plug obstructing the circulation in the brain is not generally so sudden as that from pulmonary obstruction. Dr. Fordyce Barker, of New York, Dr. Hughlings Jackson, and Dr. Finlayson give us several interesting cases occurring during the puerperal state. The prominent symptoms are those of hemiplegia of the side opposite to the site of the clot or plug in the brain. As the left cerebral artery is the one commonly obstructed, the hemiplegia is usually on the right side. Aphasia is also apt to be present.

Treatment of Pulmon ry Obstruction.—Death is generally so sudden in pulmonary obstruction that even an attempt at treatment is impossible. In those rare cases, where the patient survives sufficiently long, we have only two courses to pursue,—the free use of diffusible stimulants, and the keeping of the patient absolutely quiet mentally and physically. Ether, ammonia, and brandy are the best stimulants. Some physicians recommend alkalies, with he view of hastening absorption of the clot, but this plan, and the administration of twenty-minim doses of aqua ammonia, with the view of producing a solution of its fibrinous portion, does not meet with general approbation. All movements must be prohibited, as they might create a demand for more oxygenated blood than the lungs could supply, and hence result in fatal asphyxia. A nourishing fluid diet is generally serviceable.

Sudden Death from the Entrance of Air into the Veins.—It has long been known to the surgeon that air will occasionally enter the veins and produce alarming and sometimes suddenly fatal results. This has been particularly observable in operations about the neck, but has taken place in the veins of the uterus. It is a question, so far as the latter is concerned, whether the entrance of air is effected by propulsion or suction. It is readily understood how pent-up air in the cavity of the womb might either be forced into the sinuses and veins by contraction of this organ, or sucked in during its relaxation.

Other Causes of Sudden Death.—Many of these are of a functional nature, such as shock, exhaustion, and syncope. The first two may arise from intense or prolonged suffering, and the latter, as is supposed by some physicians, by elevating the patient too

suddenly immediately after labor from a horizontal to a sitting or erect position, especially if there be no binder around the abdomen. The latter cause is denied by those practitioners who habitually omit all abdominal supports and allow the patient to sit up immediately after labor until her bed is made up. It is not difficult to understand why the sudden emptying of the uterus by labor should leave the bloodvessels of the abdomen more free from pressure and more inclined to an influx of blood at the risk of the production of anæmia of the brain, and why such a tendency may be aggravated by a sudden elevation of the patient to a sitting or erect position at this time, especially in the absence of abdominal support. The sudden assumption of the erect position, even after a prolonged horizontal one in puerperal and other states, is not devoid of danger from syncope. The straining efforts of parturition may produce death by causing an abscess to burst into some vital part, or by producing rupture of diseased bloodvessels, or of an aneurism, or of a heart weakened by fatty degeneration.

CHAPTER XLII.

PELVIC CELLULITIS AND PELVIC PERITONITIS.

THESE diseases are embraced by Schroeder and other authors in the term puerperal fever, but as they have no essential connection with the puerperal state, I shall follow the example of Fordyce Barker, Leishman, and Playfair, in considering them separately. Although they may arise independently of the puerperal condition, they generally do not.

Barker states that when puerperal fever is endemic in Bellevue Hospital, New York, there are generally some cases of these diseases. In forty cases observed by Duncan, twenty-five were associated with the puerperal condition. Courty states that about two-thirds of all cases of these diseases arise in connection with labor or abortion.

The fact of inflammation sometimes occurring in the pelvis around the internal generative organs during the first few weeks after labor, has been familiar to the profession for a great many years, yet the terms pelvic cellulitis and pelvic peritonitis are of somewhat recent origin.

DEFINITION AND SYNONYMES.—Pelvic cellulitis, as generally used, signifies inflammation of the connective tissue around the uterus, ovaries, Fallopian tubes, and broad ligaments.

By pelvic peritonitis is meant inflammation of the peritoneum covering the uterus and appendages. Pelvic cellulitis is also called parametritis, pelvic abscess, and peri-uterine phlegmon; while pelvic peritonitis has been designated perimetritis. This difference in nomenclature has created considerable confusion in regard to the description of these diseases.

FREQUENCY.—Following the example of Nonat, Simpson, and others, all inflammations of tissues surrounding and connecting the pelvic viscera were called pelvic cellulitis, until Bernutz proved that many of these supposed cases were really pelvic peritonitis. He, however, went to the opposite extreme in underestimating the frequency of pelvic cellulitis, and in overstating that of pelvic peritonitis. Although there is a difference in the pathology and

symptoms of the two diseases, they may practically be considered together, for, owing to the contiguity of the peritoneum and cellular tissue, one is rarely affected without the other, especially when occurring in puerperal women.

It is believed that where they are distinct, which is sometimes the case when not associated with the puerperal condition, the inflammation of the peritoneum is more frequent than that of the cellular tissue.

Seat of the Inflammation.—We most frequently find the pelvic cellulitis in the cellular tissue of the broad ligaments, or at the point of attachment, posteriorly and laterally, of the cervix uteri and superior portion of the vagina, or in the cellular tissue covering the muscles of the iliac fossa. It may involve but a small portion of the areolar tissue, thus forming a small circumscribed phlegmon on one side or the other of the uterus, or the area affected may be so extensive that the uterus is imbedded or surrounded by the exudation. In pelvic peritonitis the inflammation is limited to that part of the peritoneum covering the viscera of the true pelvis. It may be very slight and affect but a small patch of peritoneum, or involve a very large extent of it, producing extensive exudation of plastic material, and matting together the organs of the inferior or true pelvis.

Both Diseases are Secondary.—The majority of pathologists agree with Mathews Duncan, that both pelvic cellulitis and pelvic peritonitis are never idiopathic, but always "secondary, either to mechanical injury or to the extension of inflammation of some of the pelvic viscera, or to the irritation of the noxious discharges through or from the tubes or ovaries." It is also generally admitted that they are more frequently secondary to inflammation of the womb, than to any other pathological condition; and that the sooner they occur after parturition, the more this is apt to be the case.

Differentiation.—As pelvic cellulitis and pelvic peritonitis are sometimes almost or quite distinct, it may be well to understand the points of supposed difference. A cellular phlegmon is not so apt to be found in the true pelvis as the peritoneal variety, but more frequently extends towards the iliac fossa, and cannot be reached by the finger in a vaginal examination; while the peritoneal phlegmon is generally found within the true pelvis, and can always be felt through the vagina. Pelvic cellulitis is more

apt to terminate in suppuration than pelvic peritonitis. There is generally more pain associated with the latter than with the former.

Schrœder insists that pain never exists in cellulitis uncomplicated with peritonitis, but he is probably mistaken.

PROGNOSIS.—These affections, under proper treatment, may sometimes terminate by resolution in a few days; but, in the majority of cases, the duration is much longer, especially if suppuration occurs, when weeks or months may elapse before recovery.

There is a great difference of opinion as to the frequency of suppuration. While Schrœder declares that he has seen it only once in ninety-two cases, Simpson observed it in half the cases of pelvic cellulitis, and Duncan, West, and McClintock in more than half. It takes place rather more frequently in pelvic cellulitis than in pelvic peritonitis. When suppuration takes place, the patient may die from exhaustion, or from inflammation being produced in parts by the bursting of an abscess. This may, for instance, pour its contents into the bowels, the bladder, or the general peritoneal cavity of the abdomen. Notwithstanding the many complications that may arise in the course of these diseases, the percentage of mortality is by no means large. Yet there are a good many who suffer more or less at times for years after apparent recovery, from obscure symptoms, having their origin in adhesions and partial displacements of the pelvic viscera, resulting from pelvic peritonitis or pelvic cellulitis.

SYMPTOMS.—Although admitting the occasional independence of pelvic cellulitis and pelvic peritonitis, I shall continue to describe them together. The symptoms may commence within a few days after labor, or not until the accoucheur has ceased his regular attendance. In some cases they may not show themselves for several weeks, or a month or more after confinement. The initial symptom is generally a chill, followed by more or less fever, and an uneasy feeling in some part of the pelvis, or pain in the back, in the pelvic cavity, behind the pubes, or in the hypogastrium. The pain may be aggravated by pressure over the pubes, or through the vagina, or in the acts of micturition or evacuation of the bowels, or by coughing. The pulse generally ranges from 96 to 118, and the temperature from 99° to 104°. The fever is of a remittent character. There is constipation, furred tongue, and loss of appetite. Sometimes there is great

difficulty in effecting an evacuation of the bowels or bladder. It may become necessary to use a catheter for the latter, and enemata and purgatives for the former. There may also be nausea and vomiting. The pain varies from the slightest weight and discomfort, to the most acute agony. It is often paroxysmal. It is generally greater in proportion to the extent of peritoneum involved in the inflammation. In cases of pelvic cellulitis, with the principal enlargements in one or the other iliac fossa, there may be no pain except upon pressure, and very moderate even then. By conjoined manipulation, we may be able to localize the seat of inflammation by the swelling and tenderness. In order to differentiate it from an inflamed or subinvoluted uterus, it may become necessary to pass a sound into the cavity of the latter, when it may be found that the womb has been displaced by the swelling. It is important to carefully explore, by the bi-manual method, the entire cavity of the pelvis and the iliac fossa, otherwise a small tumefaction might escape our notice. By so doing, we will not only be able to diagnose the location, but the character and dimensions of the tumefaction.

The Formation of an Abscess.—This method of examination is highly important in ascertaining when suppuration has taken place, because the wave of fluctuation can often be produced between the hand pressed down into the pelvis from the hypogastrium and the fingers introduced per vaginam. A highly educated finger may, however, ascertain the presence of fluid by the vaginal *toucher* alone. Suppuration is apt to be ushered in by rigors, and the fever assumes the hectic form with decided exacerbations once or twice in the twenty-four hours, but especially at night, with perspiration during the remission or intermission.

The pus may burrow around in the cellular tissue for a great distance and point at a variety of places, such as the side of the anus, or in the vagina, or beneath Poupart's ligament, or may burst into the rectum, bladder, or vagina. The long fistulous tracks sometimes formed by the pus often take several months to heal up.

Treatment—General and Local Bloodletting.—Although the age of active antiphlogistic treatment and starvation diet has passed away, the heroic doctor of the present day is disposed to look with contempt upon any plan of relief for the diseases under consideration except of the most positive and active nature. As

general bloodletting is so utterly condemned that he dares not resort to it, he holds on to the last refuge of the phlebotomist—local bleeding—and applies leeches. I am glad to see an inclination on the part of some of our most advanced modern accoucheurs, particularly Playfair, to discard this remnant of barbarism also. I never could comprehend how the abstraction of blood from the groins, the perineum, or the uterus could be of any benefit, except perhaps of the most temporary character; for it is absurd to think that the latter organ, even if relieved of its congestion by leeching, or the more cruel method still, scarification, will not in a short time become full of blood again. Aside from the absence of any permanent relief, there are, in my opinion, very positive disadvantages in the application of leeches to the vagina and cervix uteri. Their bites upon the former sometimes lead to dangerous hemorrhage, and I believe are positively irritating to the tender womb; besides they are liable to crawl into the cavity of the latter unless the os uteri is plugged, and thus create great perturbation locally and constitutionally. Moreover, they cannot be applied to the cervix uteri except through a speculum, the introduction of which in pelvic peritonitis or pelvic cellulitis is often painful and injurious.

MERCURY.—Mercury would naturally suggest itself to the old antiphlogistic doctor as essential in the treatment of these varieties of pelvic inflammation, but is discarded nowadays by the profession generally. As to blisters in the chronic stage, it may be said that they have a few advocates. Playfair thinks that when the acute stage has subsided counter-irritation by repeated blistering is often of great service.

QUININE.—As an anti-pyogenetic the modern physician has unbounded faith in the use of quinine given in as full doses as can be borne by the patient without inconvenience, during the whole course of the disease. I am sorry to protest against this heroic treatment as unnecessary and sometimes positively hurtful. When there is much pyrexia a few large doses of this medicine may be advantageous, but when it is to be given for any great length of time as a tonic, or for any other purpose, moderate doses are all that are required.

WHAT ELSE CAN WE DO? *We must depend mainly on rest, hip-baths, poultices, fomentations, vaginal douches, anodynes, purgatives, counter-irritation, and if suppuration occurs, opening of the abscess if*

necessary.—Rest in the recumbent position is absolutely essential throughout nearly the entire treatment. The hip-baths must be comfortably warm to the patient. The poultices, fomentations, and vaginal douches should also be warm. The first may be made of flaxseed meal, with or without the admixture of bread, ground marsh-mallow, slippery elm, glycerine, poppy capsules or hops, with a little laudanum, tincture or fluid extract of belladonna sprinkled on the surface. The second may consist simply of patent lint, cotton or flannel cloths, or spongio-piline soaked in very warm water, which may or may not be medicated with laudanum, decoction of hops, or poppy-heads. The poultices or fomentations should be applied to the abdomen or perineum and covered with oiled-silk. Warm water alone, or with a mixture of some anodyne or antiseptic, thrown up with a Davidson syringe or a douche apparatus, will answer for a vaginal douche. No great force should be exerted. One of the salts of morphia by the mouth, under the skin, or as a vaginal or rectal suppository, is the best anodyne. Where sleep is insufficient, naturally or by the aid of the opiate given to relieve pain, the hydrate of chloral may be administered as needed, particularly at night. The purgatives that will produce watery stools without griping are generally the best. Where great pressure is exerted on the rectum by the phlegmon or abscess, or the fæces are hard, a solution of sulphate of magnesia in some pleasant menstruum, like lemonade or orange flower-water, will generally prove effective. Enemata of soap and water, or a solution of epsom salts, may sometimes be found useful. In the chronic stage, when the tumor is hard and can be felt through the abdomen, the compound tincture of iodine, diluted or not with glycerine, or an ointment of iodine, iodide of potassium, and cosmoline applied over the hypogastric or iliac region until the skin peels off is considered good treatment. Blisters may be applied for the same purpose. Although the iodide of potassium as an absorbent remedy is considered valuless by Playfair, I have found it useful. When the patient is very excitable, nervous, and sleepless it should be combined with full doses of the bromide of potassium.

Tonics.—As tonics during the chronic stage of the disease, some one of the many elegant preparations of Peruvian bark, pepsin, iron, hops, and maltine, that the doctor can form for himself, or

order from our druggists or pharmaceutists, will be found of great advantage to the patient.

Diet.—Such simple and nutritious articles as beef or chicken tea, beef essence, milk and eggs, with more or less farinaceous food, may be allowed during the acute stage, but after suppuration has taken place the patient must be encouraged to partake freely of chicken, venison, quail, snipe, squabs, beef, and mutton, in order to sustain the system under the drain of a free and perhaps long-continued discharge of pus.

Opening of the Abscess.—It is not so much the custom now as formerly to open early and indiscriminately all pelvic abscesses so soon as formed. West, Duncan, Leishman, Playfair, and others recommend great caution in this respect. Unless an aspirator can be usefully employed it is better to wait until the pus points near the surface, especially if the matter is pushing its way beneath the rectum or vagina, as deep incisions of these parts are sometimes very dangerous. The aspirator may be used both for the purpose of exploration and evacuation. When employed for the latter purpose, if it does not draw off the pus as completely as desired, it may be supplemented by an opening made with the bistoury.

CHAPTER XLIII.

PUERPERAL CONVULSIONS.

With the exception of rupture of the uterus, puerperal convulsions, or puerperal eclampsia, is the most frightful and dangerous affection to which the pregnant or parturient woman is liable. It is not, however, confined to gestation or labor, but may occur during the puerperal state. Churchill, Meadows, and other authors describe it under the varieties of hysterical, apoplectic, and epileptic convulsions, but although its symptoms are analogous to the latter it is identical with neither variety. The fact, however, that either of these three forms of convulsions may occasionally be present during gestation, labor, and the parturient condition, renders the subject somewhat embarrassing, unless indeed we could prove that the true puerperal convulsions are always associated with some pathological condition different from these diseases.

Pathology of Puerperal Convulsions.—While pathologists generally are convinced that the precise etiology of puerperal convulsions is different from that of other convulsions, they have not fully agreed as to its essential nature. Lever, in 1843, first announced that the urine of women affected with true puerperal convulsions generally contained more or less albumen. As the presence of the latter in the urine was at that time considered sure evidence of Bright's disease, which sometimes results in the retention in the system of excrementitious matter that ought to be excreted by the kidney—particularly urea—followed occasionally by convulsions, a key to the pathology was thought to have been discovered. Drawing his conclusion from these premises, Braun and others asserted that puerperal eclampsia was the effect of toxæmia from the retention of urea in the blood. Frerichs held that the true blood poison was not urea but carbonate of ammonia resulting from its decomposition. Dr. William A. Hammond, now of New York, pronounced Frerich's opinion erroneous, but Spiegelburg in 1870, after a series of experiments, came to the conclusion that Frerich's views were correct. In course of time

it was discovered that albumen, though commonly present in the urine before the convulsions, sometimes made its first appearance during or after the attack, and occasionally was altogether absent. This clinical observation gave rise to the question in relation to the puerperal convulsions and the kidney trouble as to which was the cause and which the effect. The most that can be affirmed in the present state of our knowledge is, that true puerperal convulsions are generally associated with albumen in the urine and, perhaps, the retention of urea in the blood; but it is not fully determined whether, when so associated, the albuminuria is the cause or the effect of the eclampsia, or whether the albuminuria is essentially associated with either the acute or chronic form of Bright's disease, some authorities asserting that the pressure of the gravid uterus upon the veins of the kidneys is sufficient to produce albumen without the presence of inflammation in the latter organs. Traube and Rosenstein do not consider eclampsia as arising from the retention in the blood of urea or other excrementitious matter, whether from Bright's disease or pressure upon the renal veins, but believe it to be essentially connected with cerebral anæmia, resulting from a hydræmic condition of the blood common to pregnancy, combined in some cases with increased arterial tension caused by labor pains. They affirm that this watery condition of the blood is increased by albuminuria when the latter is present. This theory, if true, must have an important bearing upon the treatment of puerperal convulsions, as will be seen hereafter. As albuminuria is nearly always present in eclampsia, and enables us to recognize the nature of the latter, and to some extent its gravity, it is of great practical importance that we should be enabled to test the presence of albumen even though we may differ as to its precise pathological relation to puerperal convulsions. And as in the opinion of most authorities, albuminous urine is the result of Bright's disease of the kidney in an acute or chronic form, we should also understand the method of microscopic examination for tube casts. The latter examination is too complex for description in a manual on obstetrics, but it may be said in a general way that there are two simple and almost infallible tests for the presence of albumen in the urine susceptible of use by the merest tyro in clinical medicine. Allusion is made to the coagulation of the albumen by heat and nitric acid. Either test is commonly sufficient, but it is better to apply both. One plan is to hold a

test-tube containing a small quantity of suspected urine at an angle of about 45° to the horizon, and pour slowly down its side a small quantity of cold, strong nitric acid, which, on flowing to the bottom, coagulates the albumen, with which it comes in contact, producing an opacity in the column of urine most observable just above the clear acid lying at the bottom of the tube, while the urine in the upper part of the same may remain transparent. In order to avoid a fallacy in the employment of the nitric acid test it is necessary to add from ten to fifteen drops of the strong acid to about a drachm of the suspected urine. If the proportion of acid is much less than this, the precipitated albumen is dissolved by the urine upon agitation; if the proportion of acid be much more, the albumen will either not be precipitated, or if so, the precipitate will be dissolved by the excess of acid. The best way of applying the heat test is to put a moderate quantity of urine in a test-tube, and apply heat to the upper part of the column of urine. When the latter is heated to the temperature of about 150° to 160° Fahrenheit, coagulation of the albumen occurs as shown by the urine near the surface becoming *turbid* or *milky*.

It is well to bear in mind that if the urine is alkaline no precipitate will be produced by heat, therefore before employing the latter test it is better to ascertain by litmus-paper whether the solution is alkaline or acid, and if it be alkaline to render it acidulous by the addition of a small quantity of nitric acid before applying the heat. In fact it is better to supplement either test by the other in order to secure certainty.

Frequency.—The true puerperal convulsions are more common with primiparæ than multiparæ. They occur once in about six hundred labors, and are generally believed to be more common during parturition, than prior or subsequent to that period. Late investigations upon this point, however, tend to the belief that they are the most frequent prior to labor, and the least frequent after that event, while parturition represents a medium degree of frequency.

Prognosis.—At a late session of the German Gynæcological Society, held in Danzig, Lohlein, in a paper on the prognosis of puerperal eclampsia, stated the mortality to be thirty-two per cent. in one hundred and twenty-six cases from the Berlin clinic, and that no better results were reported from Königsberg, Dresden,

and La Charité. He asserted that in spite of all the new remedies, such as chloral, morphia, wet-sheet wrappings, and pilocarpine, the prognosis had not been improved. On the other hand Dr. Fordyce Barker says: "The statistics of all the published cases which I could collect in 1855, showed that 32 per cent. of all occurring before and during labor, and 22 per cent. of those after delivery ended fatally." And further on he adds: "Since 1855, I have had 7 cases in my own private practice, and I have seen 58 others in consultation practice, not including those which have been in this hospital, and in these 65 cases there have been 9 deaths, or a little over 14 per cent. Fauny asserts that the mortality under proper chloral treatment is only 37 per cent. His observations, however, extend to only 36 cases.

Symptoms.—Eclampsia more closely resembles epilepsy than any of the other varieties of convulsions. Yet it differs from them all in usually being associated with albuminuria. The history of the case, showing no previous epileptic attacks, the absence of the "aura," and the rapid succession of paroxysms, serve to differentiate it from epilepsy; while we may distinguish it from hysteria by the history of the case, the absence of "*globus*," of "*clavus*," and of abundant urine, and by the presence of a complete loss of consciousness and coma. It differs from apoplexy of the brain in not being followed by symptoms of paralysis. But independently of the foregoing points of difference between puerperal and other forms of convulsion complicating pregnancy, labor, and the puerperal state, a paroxysm of this disease is so characteristic that to have observed one attack is to make us generally capable of recognizing it when seen again. The convulsive seizure may come on suddenly without warning, but it is usually preceded by premonitory symptoms of some kind or other. One of the most common and important of these is œdema, which ordinarily manifests itself a few weeks prior to the fit. It may be seen in the feet, ankles, labia majora, and more rarely in the face and upper part of the body. It is a common occurrence in a pregnant woman to have œdema of the lower extremities unassociated with albuminuria, arising from pressure of the gravid uterus upon the large veins of the pelvis, but it is the duty of her medical adviser to insist upon an examination of the urine for the purpose of ascertaining whether or not it contains albumen, for the œdema is a trifling matter when not associated with albuminous urine, but may por-

tend serious trouble when it is. If there is albumen, a microscopic examination should next be made of the urine for tube-casts. It must not be forgotten that albuminuria may exist without the œdematous accompaniment, so that the tests for albumen should be applied under other circumstances besides the presence of œdema, especially when there are other premonitory symptoms of eclampsia—such as cephalalgia, epigastric pain, and dimness of vision or blindness.

Paroxysm.—Although a paroxysm of eclampsia is generally preceded by one or more of the foregoing precursory symptoms in a more or less marked form, it may set in suddenly without any warning whatever. The first phenomenon of a fit consists in twitching of the muscles of the face, eyelids, and eyeballs. After a few seconds the twitching gives place to tonic contraction of the facial muscles, the mouth being drawn towards the left side, followed slowly by the face. The eyeballs roll up in such a manner as to show only their white inferior segments through the half-closed lids. In a few moments the face slowly moves towards the right side, and almost immediately tonic contraction of the muscles of the trunk, extremities, and neck occurs, as shown by the backward curve given to the spinal column, with one or both thumbs compressed in the palm by the fingers; the rigid trunk and extremities—the latter generally being extended; the prominent jugular veins, the throbbing carotid, the swollen neck, the momentary suspension of respiration. The latter symptom is produced by the contraction of the muscles of the larynx and throat, closing the air-passages, but permitting the air contained in the lungs at the time of the fit being forced out by a contraction of the thorax, thus causing a peculiar interrupted hissing expiration. The face assumes a livid hue, and sometimes the tongue is caught between the closed jaws and horribly lacerated. The pupils are dilated, and the pulse is hard and full. There is a complete loss of sensibility and consciousness. This tonic stage of eclampsia seldom lasts longer than half a minute; but the clonic stage soon succeeding it lasts from one to ten minutes. Instead of the head, trunk, and limbs being rigidly contorted as before, they now commence to jerk, causing the patient to assume at one time the most ludicrous and at another the most frightful grimaces. Fortunately, the respiration is only interrupted, not completely held in abeyance as in the tonic period of the convulsions, or the patient would

inevitably die from asphyxia. Although the pulse is strong and full at the beginning of a paroxysm, it becomes rapidly accelerated, and finally very frequent and feeble.

There is foaming at the mouth and a peculiar noise or stertorous expiration. The insensibility and loss of consciousness continue. After a short time, however, all these symptoms commence to abate, and some of them soon disappear entirely, at least for awhile. The spasmodic movements, for example, become gradually less severe and frequent, and finally cease, the respiration, the circulation, and the color of the skin become normal; but the return of sensibility and consciousness is not so rapid. A comatose condition now sets in of a more or less profound character, according to the severity of the previous spasms. This may be very slight and of short duration, or may be severe and prolonged, even extending from one paroxysm to another when they recur, as they may do, in a few hours, or even a few minutes. A patient may have only a single fit or a great many. The period of clonic convulsions is the most frightful to bystanders, but that of tonic spasms by far the most dangerous.

Prophylactic Treatment.—If the physician be made aware of the presence of premonitory symptoms of eclampsia, especially albuminuria, he may by judicious management ward off the paroxysms. Of course, the treatment will depend upon whether the albuminuria be caused by pressure upon the renal veins by the gravid uterus, or upon inflammation of the kidneys, but still a depletion from the vascular system of a portion of its watery constituents is generally advisable; and for this purpose saline diuretics and purgatives producing watery stools are usually of great benefit. The acetate of potash, the bitartrate of potash, or a combination of jalap and cream of tartar will generally answer the purpose. Acidulated drinks and baths may also be used. Some authorities consider colchicum of great service, and others digitalis and broom-tops. The vapor-bath, especially the Turkish, is useful to excite proper action of the skin. Some practitioners use jaborandi and pilocarpin for the latter purpose, but others have found their action too depressing for ordinary use.

Induction of Premature Labor.—The advisability of inducing premature labor in severe and obstinate cases of albuminuria has in recent times been much discussed. While many are opposed to it, Hofmeier, Playfair, and others consider it a proper operation in

all cases where the quantity of albumen is very great and constantly increasing in spite of judicious treatment, especially if complicated with dizziness, headache, or loss of sight, as convulsions are chronic. Bright's disease may thus be prevented. But this subject of prophylactive treatment having been discussed in Chapter XIV, I shall proceed to the treatment of convulsions themselves.

Curative Treatment.—General blood-letting, once so popular in the treatment of nearly all the ills of poor humanity, having gradually been abandoned in all other diseases, still finds lukewarm supporters as a means of temporary relief during the paroxysms of eclampsia, even among a few of the most advanced accoucheurs of the present day, except in cases associated with Bright's disease. Leishman and Playfair, while indorsing the opinion of Schrœder, that the abstraction of blood is temporarily useful by diminishing, for a short time, vascular tension or pressure, but is permanently injurious from the fact of the quantity of blood being soon replenished through the absorption of serum, thus resulting in its deterioration, and yet no permanent relief of pressure, still believe that a moderate or single depletion may occasionally be of service, temporarily, while other means of relief are under preparation. This moderate concession to the favorite remedy of thirty years ago will not prevent the modern student from viewing with consternation the extent to which bloodletting was carried in the time of Denman, when it was generally practised several times in the same patient, and, in some cases, as many as eighty times. Most modern practitioners in Great Britain and the United States reject it altogether.

Anæsthetics and Narcotics.—The remedies chiefly relied upon in modern times for the treatment of the paroxysms of puerperal convulsions during gestation, labor, or after labor, belong to the class of anæsthetics and narcotics, such as ether, chloroform, hydrate of chloral, and morphia. The first two are best administered by inhalation, and just prior to the fit. There is no doubt but that a timely and judicious use of these agents will often stave off the paroxysm; where it does not, the patient may be kept under its influence during the fit, until the approach of stertor warns us that the agent cannot be safely pushed any further. In some cases it may be well to keep the patient under its influence during the entire interval between the paroxysms. A few prac-

titioners advise full anæsthesia to be kept up during the entire paroxysms and intervening periods. But this heroic practice seems to be highly dangerous. It is now becoming fashionable to substitute ether for chloroform because of its supposed greater safety. It is, however, very doubtful whether its action is as soothing and effectual as that of chloroform.

HYDRATE OF CHLORAL.—There are many cases where the hydrate of chloral may supplement the use of chloroform or ether, or be substituted for it. Dr. H. H. Kane, of New York, in an article in the Amer. Jour. Obstetrics, April, 1881, on the use of this drug in puerperal eclampsia, uses the following language: "In this very common and exceedingly distressing disease, chloral hydrate has scored its greatest triumph. The commendations bestowed upon its action, in a few cases in the early history of the drug, have been more firmly based by successes attending its exhibition in a large number of cases since. From what I have been able to learn, it was first employed by Serré, of Bapaume, France and later, in every part of the civilized world. It is not claimed for it that it cures every case, for this would place it in the high rank of a specific, and this it certainly is not. It has, however, cured more cases than any single remedy or combination of remedies known to us.

"Fauny was able to collect thirty-six cases, which number included seven cases observed by himself, treated by chloral. After a careful study of these cases, and all others treated by divers methods, up to the date of writing, he comes to the conclusion that the largest number of recoveries have occurred under the chloral treatment. Of the thirty-six cases treated by chloral, there were thirty-three recoveries, giving a mortality of 3.7 per cent., as against thirty-six to forty-five per cent. from bleeding; nineteen per cent. with anæsthetics, and from twenty-six to thirty-five per cent. from the usual obstetric treatment.

"Choupée gives thirty-six cases. In sixteen of these this drug was associated with other remedies. In twelve cases, where chloral alone was used, all recovered.

"Portal relates three cases thus successfully treated, and remarks: 'In six previous cases treated by leeches and inhalation of chloroform, all died.'"

Further on Dr. Kane writes: "Testut insists on the use of large doses, and, whenever possible, gives the drug by the rectum. To

pass the drug well up, he attaches a soft catheter to the end of the syringe, thus forcing the medicine high up into the large bowel, where, he says, there is to be obtained more rapid and thorough absorption, and less liability to expulsion during a pain. He claims that chloral is a direct irritant to the gastric mucous membrane, and should never be given in that way when it can be given by the rectum. In case it is impossible to administer the drug by either of these channels, he advises intravenous injection, after the method, and with the instrument, of Oré. He condemns the hypodermic plan, as producing extensive sloughing. By the rectum, he uses ʒi, as an initial dose, and fifteen grains every hour until the spasms have ceased. Should there be any symptoms of another eclamptic fit, he meets it at once with a fifteen-grain dose. The solution used is 1–10 or 1–20. He condemns Whidborne's plan of using rectal suppositories, claiming that they are apt to produce sloughing."

Bromide of Potassium.—Full doses of bromide of potassium will also be found useful, given in some pleasant menstruum, either separately or in combination with the hydrate of chloral.

Morphia.—Notwithstanding theoretical objections against opiates, morphia has been found useful in quieting the violent motion of the muscles. From one-fourth to one-third of a grain may be administered hypodermically every two or four hours for awhile. It is not intended as a substitute, but rather as a supplement, to ether or chloroform.

Dr. C. C. P. Clark, of Oswego, New York, and others, in recent communications to medical journals, claim great success in the treatment of puerperal convulsions by injecting beneath the skin from one to three grains of the sulphate of morphia, and repeating this enormous quantity once or more, if necessary, at intervals of two hours.

I have found a combination of the acetate of morphia and hydrate of chloral, administered by the mouth, very useful in puerperal convulsions. Some late writers state that it is dangerous to use hypodermic injections of morphia soon after giving the hydrate of chloral. This is probably true in regard to very large doses, but not so in respect to moderate ones.

The muriate of pilocarpin has been used by subcutaneous injections, upon the theoretical idea that the salivation and sweating produced by it, might free the blood from poisonous materials,

and relieve tension of the arterial system. The dangerous depression produced by it, has deterred experiments, so that its efficacy, if it has any, has not been established.

CATHARTICS.—Free, watery evacuations of the bowels are often of great service during convulsions, by freeing the intestines from sources of irritation, and depleting the system of serum, in the hope of diminishing tension of the bloodvessels. If the patient be unable to swallow, a fourth of a grain of elaterium, or one or two drops of croton oil, mixed with sweet oil, and placed on the back of the tongue, will generally cause a few copious stools. If the patient can swallow, a dose of the compound jalap powder, in syrup, or an ounce of epsom salts, dissolved in lemonade, might answer the purpose.

SPECIAL OR OBSTETRIC TREATMENT.—While some authorities insist that all artificial efforts of emptying the uterus during gestation or labor are too prolonged and too irritating to be of service in eclampsia, others urge the induction of premature labor, or the hastening of actual parturition, in all cases of severe convulsions. The medium course is perhaps the best. For instance, where all the usual means of controlling the paroxysms prove fruitless, and it is highly probable that the presence of the fœtus in utero produces more irritation to the system than the artificial means necessary for its expulsion would cause, we may remove the child by the forceps or craniotomy, depending upon the nature of the case. Turning of the child, except in mal-positions or mal-presentations, is rarely advisable. Artificial dilatation of the cervix must not be used. The patient should be under the influence of an anæsthetic. As she is very apt to lacerate her tongue, a stick, covered with a piece of muslin or flannel, should be inserted between her teeth. Gentle means of restraint, to prevent her from falling out of bed or otherwise running the risk of injury, ought to be adopted.

CHAPTER XLIV.

PUERPERAL INSANITY.

THIS name, although not quite so familiar to the profession as puerperal mania, is preferable in not implying the constant presence of mania. It nevertheless possesses the imperfection common to both terms of indicating the disease as occurring only during the puerperal period, whereas it is intended to be understood in a generic sense as embracing the insanity of pregnancy, of labor, of the puerperal state, and of lactation.

There is no disease more painful to witness than puerperal insanity, especially in its maniacal form, when occurring soon after the birth of the child, a period otherwise so joyful to the new-made mother.

FREQUENCY.—Among 1644 insane women reported by Dr. Haslam as admitted at Bethlehem Hospital, 84 cases were of puerperal insanity, and in 1119 admissions into La Salpêtrière there were 94 cases of this variety.

If we take an average of the very extensive statistics furnished in the papers of Marcé, J. B. Tuke, and Scanzoni, we shall find the percentage of puerperal insanity to insanity in general in European institutions for the insane to be about 7.3. The relative frequency of the three principal classes of puerperal insanity with each other, according to returns from the Edinburgh Asylum, may approximately be considered as follows: Insanity of pregnancy, 18 per cent.; true puerperal insanity, 47 per cent.; insanity of lactation, 34 per cent. Only the worst cases being admitted into large asylums, the statistics from such institutions can furnish no more than an approximation to the ratio of one class of puerperal insanity to another as occurring in private practice. The frequency of puerperal insanity in its generic sense to labor is shown by the returns of the following two extensive lying-in institutions. Johnston and Sinclair state that in 13,748 cases of labor in the Dublin Lying-in Hospital, there were 26 cases of mania, or 1 in 528. At the Westminster General Lying-in Hospital there were in 3500 cases of labor, 9 of mania, or 1 in 383.

CAUSES.—The predisposing cause of at least half the cases of puerperal insanity, according to Doctors Burrows and Gooch, is hereditary. Sleeplessness is also a powerful predisposing cause, although some authorities consider it rather as one of the first symptoms than a cause. Gestation, the puerperal state, and prolonged and excessive lactation may be considered as both predisposing and exciting causes; so may shame and fear of exposure in pregnant unmarried women and unlawfully pregnant married women.

The proper exciting causes are irregularities of diet, unwholesome or improper food, constipation, cold, irritation, sudden mental shocks, anxiety, distress of mind or body, excessive secretion of milk, morbid secretions in the breasts, profuse hemorrhages, fright, suppression of the lochial discharge, etc. Puerperal insanity has been known to alternate with inflammation of the peritoneum or uterine organs.

IS THERE ANY ESSENTIAL DIFFERENCE BETWEEN PUERPERAL AND OTHER FORMS OF INSANITY?—Authorities are divided upon this question. Schroeder says that the mental diseases of puerperal women have by no means particular and distinctive characters. It suffices to say that gestation, labor, and the puerperal state are very powerful etiological factors in certain mental disturbances." On the contrary, Tyler Smith asserts that the answer to the preceding question will very much depend upon whether we take a large or a circumscribed view of such cases. If we look at the patient during the attack alone, the symptoms, it is true, vary little, if at all, from some other cases of insanity. If, however, we consider the previous and subsequent histories of cases of this kind, we shall come to the conclusion that there are special features arising out of the facts that the functions whose disordered conditions produce the insanity are not permanent, but temporary; that patients, the subjects of puerperal attacks, are not so liable as others to renewed invasions of derangement, particularly after the child-bearing epoch has passed, and that they are not so likely to transmit a hereditary taint to their offspring." These diverse views have a highly important bearing upon the management of puerperal insanity, as will be seen under the head of treatment.

PATHOLOGY.—There is great diversity of opinion concerning the pathology of puerperal insanity. Some authorities believe it to be essentially connected with inflammation of one or more of the sexual

organs, particularly the uterus or ovaries; others with the brain and its membranes. But the majority of modern pathologists deny that it is essentially associated with inflammation of any tissue or organ, and assert that when inflammation exists it is only a complication. They believe with Gooch, "that the disease is not one of congestion or inflammation, but one of excitement without power." While another party think that many of the severe cases of mania arise from congestion or inflammation, but that the milder cases, and all those of melancholia, spring from an exhausted condition of the system. Sir James Y. Simpson having discovered albumen in the urine in four consecutive cases of puerperal insanity, was disposed to think that its presence might have some essential connection with the cerebral derangement. In his cases the albumen could be detected only for a short period after the commencement of the insanity. In 1863, or five years subsequent to the publication of Simpson's views, Dr. Donkin, in a paper upon the same subject, arrived at the conclusion "that the acute dangerous class of cases are examples of uræmic blood-poisoning, of which the mania, rapid pulse, and other constitutional symptoms are merely the phenomena; and that the affection, therefore, ought to be termed uræmic or renal puerperal mania, in contradistinction to the other form of the disease." Dr. Fordyce Barker has found the association of albuminous urine and puerperal insanity so rare that he considers it a mere coincidence; and such seems to be the general opinion of later observers.

Prognosis.—The medical attendant must be prepared to reply to many anxious inquiries in regard to the prognosis of puerperal insanity, chiefly upon two points: firstly, as to whether the patient is likely to die; secondly, and if not, whether she will ever fully recover her mind. The maniacal variety is the most dangerous to life; but the other form, or melancholia, gives the least hope of permanent recovery of the mental faculties. The least hopeful cases are those complicated with inflammation of the brain, or other important organs. The average mortality in hospitals is about eleven per cent.; but this is greatly above the ratio in private practice, as one would naturally suppose, when it is remembered that only the most severe and hopeless cases are sent to asylums or hospitals for the insane. In private practice the majority are restored to health of body and mind. There are two symptoms of fearful significance, when jointly present—a

rapid pulse, and continual great restlessness. The latter by itself is not very serious, but the rapid pulse is always a source of great anxiety in puerperal patients.

Duration.—The duration of mania is generally from two to three months, although recoveries do occur earlier, and much later. As a rule, it is shorter than in cases of melancholia. For convenience of description, puerperal insanity may be divided into four classes:

Insanity of pregnancy.

Insanity of labor.

True puerperal insanity.

Insanity of lactation.

In each of which, except, perhaps, the second, the type of the disease may be either mania or melancholia; the latter being the form that the insanity of pregnancy and the insanity of lactation usually assume, while mania is the predominant type in the true puerperal insanity.

Insanity of Pregnancy.—As just stated, this is generally of the type termed melancholia. It may last during the whole period of gestation, but generally it commences about the end of the third month and lasts till near the close of pregnancy. The *suicidal tendency* is commonly very great in this form of insanity, or the moral perversion may assume the form of *dipsomania*, or *kleptomania*.

Insanity of pregnancy is more common in primiparæ than in multiparæ, if the first pregnancy be compared to the second, third, or fourth separately, but not collectively; the reason being the greater dread and apprehension of women pregnant for the first time, particularly when over about thirty years of age.

Insanity of Labor.—This may more properly be termed the delirium, or phrensy, of labor, as it is of short duration. It usually occurs just when the head is passing through the os uteri, or the vulva. This variety of insanity is transitory in character, rarely lasting over a few minutes, and leaving no unpleasant symptoms behind; although occasionally it continues for a short time subsequent to the birth of the child, and may lead to suicide or infanticide. The latter often becomes a delicate subject for medico-legal investigation.

The insanity of labor sometimes takes the form of hallucination; the patient imagining that she sees spectres, as in a case

described by Tarnier, or that she is drowning, as in an instance related by Barker, or that she is burst and blown into small fragments, as in the only case of transient mania during labor that I have ever seen.

TRUE PUERPERAL INSANITY.—This is the name given to that division of puerperal insanity making its appearance during the puerperal state, or within a month or six weeks after parturition. It generally assumes the type of acute mania, but occasionally that of melancholia, which rarely comes on so early after labor as the first.

INSANITY OF LACTATION.—Unlike the insanity of pregnancy, the insanity of lactation manifests itself more frequently in multiparæ than in primiparæ, and commonly in those worn out and exhausted by frequent pregnancies and long-continued nursing. This form of insanity is essentially due to cerebral anæmia, and is almost invariably of the melancholia type, though mania predominates in a very few cases. The insanity of lactation is more apt to become permanent than that of pregnancy, labor, or the puerperal state; hence one reason why the physicians of hospitals and asylums for the insane see more of it than the obstetrician.

SYMPTOMS.—The actual phenomena of insanity are the same in the different conditions of the pregnant and nursing woman, as in the non-puerperal patient, provided the type is identical. There are two types, the maniacal and the melancholic.

MANIA.—Although it may occasionally be developed without any prodromic symptoms, it most commonly gives forewarnings. The patient has generally a very restless, excitable, and suspicious manner, accompanied by an excessive talkativeness, or obstinate silence, great sensibility to noise and light, and inability to sleep, and a causeless hatred to persons of her acquaintance, especially her husband or baby, or other dear relatives and friends. If disposed to talk, her words and expressions are incoherent and rambling, or loud and boisterous, coming forth in a perfect torrent, without any connection or meaning. The facial expression of a commencing attack is peculiar, and evinces either *fright* or *fury*. If the student desires to receive an indelible impression of this expression of a raving maniac in a moment of greatest fury, let him meet one alone, either male or female, and have no means of controlling the patient. I have faced danger in a great variety of ways, with, perhaps, as little trepidation as most men, but I have

to this day a sense of horror on recalling the demoniac fury expressed by the face of a madman, whom I once unexpectedly encountered. It was twenty-five years ago, in the forests of Oregon several miles from any habitation. This man was celebrated for having crossed the plains with his baggage in a wheelbarrow, believing himself specially called by the Almighty as a missionary to the Rogue River Indians. Having been with these Indians for a few months, and given the agent much trouble on account of his lunacy, the latter had him ejected from the Indian reservation, whereupon he started for the city of Washington to lay his complaint before the President. On arriving at Portland, the captain of the steamer refused him passage, and he attempted to return to the Indian Agency. On meeting him, about sundown, on his lonely journey, I deemed it an act of humanity to assist him to the nearest farm-house, where he might be temporarily cared for, until in a better condition for renewing his walk. I had previously seen him in slight paroxysms of mania, but his fury that night was awful; a gorilla of an African jungle would have made almost as pleasant a travelling companion.

The puerperal maniac, when the malady is fully developed, stares wildly around her at imaginary objects, and repeats any word she may chance to hear from bystanders over and over, jumps out of bed and out of the window, too, if not prevented, talks in a boisterous and often obscene manner, and sometimes swears with the volubility of an army teamster. If the attack occurs shortly after labor, the lochial discharge and secretion of milk become lessened, and in very bad cases entirely cease. Of course if it does not come on until after the natural cessation of the lochia, the milk alone is thus affected. The patient's countenance is flushed, her eyes assume a morbid lustre, there may sometimes be excitement of the circulation, although the pulse is not usually much accelerated. The tongue is coated, the skin bedewed with perspiration. Of course the maniac is not always in a state of fear or fury. Before and after the storm, there is a period of comparative calmness, in which the patient is sometimes more or less rational, which condition is succeeded every now and then by a fresh outbreak of fear or fury. There are all degrees of severity in the maniacal paroxysms; while some are very mild, others are exceedingly violent. Their recurrence may be very rare or quite frequent. A patient with mania will often go for

days or weeks without sleeping or eating, except under compulsion of drugs, or artificial aids to the reception of food. Without proper care there is danger of mistaking puerperal mania for phrenitis, but the hard and quickened pulse, the suffused eye, the warm skin, the intolerance of light and sound of the latter affection, will generally prevent error.

Melancholia.—Although the true puerperal insanity may sometimes be characterized by melancholia, the latter is almost exclusively confined to insanity during pregnancy and lactation. This type of mental derangement, instead of being marked by mental excitement or violence, may be characterized by great depression of spirits. A deep despondency takes hold of the patient, who is listless, silent, and apathetic, has deranged digestion, usually a normal pulse, costive bowels, and sleeps badly or not at all. The mental depression becomes deeper and deeper, the patient sometimes sitting for hours without moving or speaking. These cases are rarely marked by much mental excitement, but often by delusions, and a tendency to suicide.

Treatment of Puerperal Insanity.—The management of cases of puerperal insanity must depend a great deal upon whether mania or melancholia characterize the disease. Thirty-five years ago bleeding and blistering entered largely into the treatment of the former type of insanity. These remedies have been discarded by the modern physician, who deems that the two things most needed in both varieties of insanity are sufficient sleep and food. Chloroform and chloral hydrate are considered the best remedies to produce the former. Still there are a few physicians who believe that, where the disease is not complicated with phrenitis, an opiate in full doses is often of very great service. Others are entirely opposed to the use of any preparation or active principle of opium. In cases of great vascular excitement a few physicians, like Sir James Y. Simpson, think a good deal of the tincture of veratrum viride and tincture of aconite, in doses of one or two drops, while Leishman and others consider that tartar emetic is a most effective remedy. Many practitioners consider a tepid bath prolonged for about ten minutes to be a highly useful arterial sedative. As nervous sedatives, hyoscyamus and camphor have been found beneficial.

Hypnotics.—Our chief reliance must, however, be upon chloroform and chloral hydrate, especially when their soporific properties

are required. They may be used either singly, or supplemented by bromide of potassium, or bromide of sodium. During the acute stage of mania, where natural sleep is impossible, it may be necessary to administer from twenty to forty grains of hydrate of chloral once, twice, or thrice almost every night. The interval between doses when one dose is insufficient to produce sleep should be about an hour. The bromides of iron and camphor are sometimes serviceable. I have found excellent results from a combination of acetate of morphia and chloral hydrate in quieting the patient and producing sleep. The inhalation of the vapor of chloroform is particularly adapted to cases where the patient is obstinate and violently unruly.

Of course, where medicines cannot be given by the mouth, by inhalation, or hypodermic injections, they must be by enema or suppository. Although as a rule, the dose of many drugs when administered by the latter method must be increased from two to three fold, the hydrate of chloral is an exception, requiring the same quantity as by the mouth.

Purgatives.—Cathartics are always necessary at some stage of the disease, and sometimes act almost magically by relieving the bowels of all sources of irritation.

Emetics.—Some practitioners consider emetics of great service. The milder drugs of this class may be allowable in cases of overloaded stomach, but it is difficult to see how otherwise they could be of any service.

Stimulants.—Alcoholic and similar stimulants are not so useful in mania as in melancholia, and are often injurious, yet some practitioners having before their eyes the picture of exhaustion and debility only, recommend them in all cases and stages of the complaint. Malt liquors are generally preferable to distilled.

Food.—One of the most difficult things to accomplish in the management of the insane woman is to induce her to take sufficient food. Some nurses are much better than others, in overcoming the obstinacy of lunatics on this point. When persuasion and other mild means prove of no avail, force must be used. Of the numerous contrivances employed for this purpose the simplest is to inject into the mouth a small quantity of liquid food at a time, while the jaws are held apart by a stick. Some use a cork for the latter purpose, but it is too soft; others a spoon, but it is too hard. A common rubber syringe may be used for the injec-

tion, or an india-rubber bottle with an ivory nozzle, or what is better, Paley's feeding-bottle. It is not safe to inject more than two tablespoonfuls at a time, as the patient must be permitted to breathe between each act of swallowing. In extreme cases, feeding by a double-acting stomach-pump will be required, a pint of fluid being injected at long intervals.

Shall the Patient be Treated at Home?—This is a very delicate question and one sure to arise. In its decision many things have to be taken into consideration. On the one hand the usual antipathy of the patient to her nearest relations and best friends, and the difficulty of obtaining trained or suitable nurses. There are but few of the ordinary nurses who know how to properly carry out the principles of mercy, tenderness, and firmness, so necessary in the management of the insane. On the other hand there is a certain stigma attached to a residence in a lunatic asylum which becomes very annoying to most women upon the recovery of their reason. This ought to be avoided when possible. It is sometimes better, in order to avoid these difficulties, to place the patient in a pleasant and suitable house, with no occupants but her nurses, who should of course watch her, and attend to her necessities and comforts carefully both by day and night. The patient's room should be well ventilated, cool and slightly darkened. As quietude is what the patient needs, no visitors as a rule should be allowed to see her during the acute stage, although there are exceptions in the chronic and mild forms of mania, and especially in melancholia, when a judicious friend may occasionally be permitted to converse with her. Great caution must, however, be exercised both by nurses and visitors, to avoid conversation upon things that are likely to be a source of irritation to the patient.

Difference of Treatment between Mania and Melancholia.—There is no essential difference between the treatment of mania and melancholia, except that during the acute stage of the former more active measures are required to subdue the paroxysms of excitement in the manner already stated; and also with the exception that a stimulant and tonic course of treatment, though necessary throughout the entire course of melancholia, is not so imperatively needed, and may be objectionable, during the acute stage of mania.

CHAPTER XLV.

PUERPERAL SEPTICÆMIA, OR PUERPERAL FEVER.

History.—It was recognized even in the days of Hippocrates, that lying-in women were subject to a fever of a severe grade, often resulting in death. In course of time the disease received the name of childbed fever, and subsequently of puerperal fever. Under the latter name it is still generally known, but many modern authors are disposed to call it puerperal septicæmia.

Mortality.—The mortality of this malady has sometimes been fearfully great, especially in large lying-in hospitals like the Hôtel Dieu of Paris, where it raged with great violence in 1664 and 1678. But a separate obstetric department of the Hôtel Dieu, called the Maternité, was particularly signalized for the frequency and extensive mortality of childbed fever in its wards. In 1829 there were 252 deaths in 2788 lying-in women; and in 1831, 254 in 2907 cases. It also caused fearful ravages in the London lying-in hospitals in the years 1760, 1768, and 1770. In the Edinburgh Infirmary, in 1773, almost every woman, within twenty-four hours after labor, took the disease and died.

The great prevalence and virulence of puerperal fever in nearly all the large lying-in hospitals in various parts of the world, as compared with private or domiciliary practice, has given rise to a general belief that these institutions are specially dangerous as formerly constructed and conducted. It is agreed, however, that where these buildings are erected upon "the cottage plan," with all the modern hygienic means adopted, for the preservation of healthfulness, that the prevalence and mortality of puerperal fever will be reduced to a minimum.

The Nature of the So-called Puerperal Fever.—The man of positive opinions on all subjects is to be envied, because of the comfortable assurance that a firm belief or disbelief in any doctrine affords him. But when among a number of learned and experienced clinical observers in diseases of women some state that puerperal or childbed fever is essentially a zymotic disease peculiar to puerperal women, as specific in its nature as typhoid or

typhus fever, or small-pox, and bears the same relations to local concomitant pathological conditions as the ulcers in the solitary glands and glands of Peyer do to typhoid fever, or the pustules on the skin to small-pox; while others affirm that the disease is essentially a local inflammation like phlebitis, peritonitis, metritis, or lymphangitis, producing constitutional effects of a secondary character; others again, that the malady is only a form of pyæmia or septicæmia, modified somewhat by the puerperal condition of the patient; we must consider the nature of puerperal fever as undetermined. The local inflammation theorists are divided among themselves as to the seat of the inflammation, and have been contending against each other so vehemently, that from this cause, and the pressure from without, their hypotheses are fast declining in popularity. Latterly the contention is chiefly conducted between the zymotic and septicæmic theories. We shall, although with some misgivings, adopt the latter theory, because most, if not all the phenomena of the so called puerperal fever can be more simply described under the head of septicæmia than under that of any other name as yet suggested.

Puerperal Septicæmia.—By this term is understood a disease arising in women during the puerperal state, from the absorption into her system of septic matter or organic material in the process of decomposition. It probably differs in no essential feature from surgical septicæmia. This poisonous material may originate within the generative organs of the patient or have an external source. It is not necessary for it to be specific. A decomposing clot of blood, fragment of the placenta or fœtal membrane, a putrid fœtus, a sloughing portion of the uterine tissues, or a particle of some disease existing in the womb prior to pregnancy, like carcinoma, may constitute the poison, which may be taken into the system through any solution of continuity of the mucous membrane of the vulva, vagina, or uterus. The site of the placenta is considered the easiest and most usual channel of introduction into the circulation of the septic matter originating in the cavity of the womb, but that coming from without is more usually absorbed at the site of abrasion or laceration of the cervix uteri, vagina, fourchette, or perineum. Hence the greater frequency of septicæmia in primiparæ than in multiparæ. It is even possible for septic matter to be absorbed through an unbroken mucous membrane. Puerperal septicæmia is said to be *autogenetic* when the

poison is generated within the patient, and *heterogenetic* when it is conveyed from without. Among the latter causes we may include *cadaveric poison*, or that conveyed to the parturient woman by the hands of her medical attendant from the dissecting-room of the post-mortem or anatomical theatre; and *zymotic poison*, or that conveyed in a similar manner from the room of a patient sick with erysipelas, scarlet fever, or other zymotic affection. Septic material from a puerperal fever patient may be transferred in the same way.

While it is probably true, as asserted by Barnes, that there is less risk of infecting a puerperal patient after the dissection of a person dead from an ordinary complaint than from a contagious malady, yet there is great danger even in the former instance. I am so well convinced of this from the numerous positive proofs upon record, and from my own observation, that I have sometimes declined midwifery practice for awhile after performing dissections upon the dead, and have generally refused practical obstetric instruction to students while they were engaged in similar duty. This precaution is recommended by several modern authors. On the other hand it is stated by Dr. C. L. Mitchell, of Brooklyn, N. Y., that "the contagion of childbed fever is much more active than that of septic poison in surgical wards, yet during the continuance of an epidemic of puerperal fever in the Charity Hospital, Dr. Lusk passed several hours daily in the wards, but not a single case in his private practice developed an unfavorable symptom. He used "Labarraque's solution to disinfect his hands, washing them to the elbows perhaps twenty times a day."

Dr. Matthews Duncan, of London, says on the same subject, that "the most important researches (as to the poison producing pyæmia)—those of Lister and his followers—consist in the attainment of results in practice, equally *wonderful* and valuable, results that justify the belief that pyæmia is a septic disease, and that puerperal pyæmia may be almost, if not altogether, prevented by the application to delivery of a practice based on antiseptic principles." He further writes: "As practice is at present conducted by careful practitioners, I believe it is nearly as safe as can be. During nearly thirty years of obstetric experience, in private, in hospitals, and in consultation, I have not, as a precaution, given up work for a single day. The grand precautionary measures for obstetric practitioners are: 1st. Avoidance of duties as nurses.

2d. Avoidance of using the hands in post-mortem examinations. 3d. Antiseptic cleanliness of the hands and clothes."

In order not to mislead the reader it is necessary to state that Dr. Duncan uses the term puerperal pyæmia for puerperal septicæmia. Playfair, in calling attention to the influence of cadaveric poison, says that attention was particularly directed to this source of infection by the observations of Semmelweiss, who showed that in the division of the Vienna Lying-in Hospital attended by medical men and students who frequented the dissecting-rooms, the mortality was seldom less than 1 in 10, while in the division solely attended by women the mortality never exceeded 1 in 34; the number of deaths in the former division at once falling to that of the latter as soon as proper precautions and means of disinfection were used."

Infecting matter may be conveyed upon the hands of the accoucheur, upon his instruments, or upon the hands of the nurse and her implements, upon sponges, bed-pans, and sheets, from puerperal fever patients, or others affected with any of the zymotic fevers. Numerous instances of this kind have been observed where the evidence was beyond all question. Such as where one physician or nurse communicated puerperal septicæmia to every patient to which he or she was called in an extensive practice of months at a time, while no other accoucheur or nurse in the neighborhood or city had a single case. It is unnecessary to multiply examples. Dr. Tyler Smith states that two medical men, brothers and partners, attended in the space of five months twenty cases of midwifery. Of these, fourteen were affected with puerperal fever—a fatal result ensuing in eight cases. The only other known death from puerperal fever, in the same town, within the period named, occurred in the case of a patient attended by a medical man who had assisted at a *post-mortem* of one of these puerperal patients. After this disastrous period the two brothers relinquished all their midwifery engagements for one month, in which time five of their cases were attended by other practitioners, and no instance of fever occurred in the course of that month. They then returned, and several fatal cases again happened."

Sir James Y. Simpson relates in his "Selected Obst. Works" the following interesting example: "In 1836 or 1837, Mr. Sidey, of this city, had a rapid succession of five or six cases of puerperal fever in his practice, at a time when the disease was not known to

exist in the practice of any other practitioners in the locality. Dr. Simpson, who had then no firm or proper belief in the contagious propagation of puerperal fever, attended the dissection of Mr. Sidey's patients, and freely handled the diseased parts. The next four cases of midwifery which Dr. Simpson attended were all affected with puerperal fever, and it was the first time he had seen it in practice. Dr. Patterson, of Leith, examined the ovaries, etc. The three next cases which Dr. Patterson attended in that town were attacked with the disease."

It is probable that antiseptic precautions were not used in these and many similar instances reported, and that the results might have been different if they had been. While I would advise the student to use them, he should not place absolute reliance upon such means, as they have been known to fail. In fact, the question is already being agitated as to the reliability of most of the disinfectants and antiseptics in common use, such as carbolic acid, chloride of lime, Labarraque's solution of chloride of soda, permanganate of potash, chloride of zinc, salicylic acid, sulphate of iron, a mixture of sulphate of zinc and chloride of sodium, tincture of iodine, etc.

Even Listerism, now so popular, may have its day, for it should be remembered that there are fashions in medicine as well as in social life, and that grave and learned doctors are sometimes influenced by them more than they are aware.

Idiopathic Fevers.—Any one of these fevers may attack a puerperal woman and be attended with the same phenomena as in a non-puerperal person; or it may simply produce in the former a septicæmic fever without developing any of its own characteristics. Surgeons have for many years noticed a very close relationship between surgical pyæmia, or septicæmia, and erysipelas, and so of late years has the obstetrician, between this complaint and puerperal fever, or puerperal septicæmia. It is exceedingly dangerous to have either surgical or lying-in cases adjacent to erysipelas patients, or—but in a less marked degree—near those with scarlet fever or any of the zymotic fevers. Septic matter may not only be communicated in the various methods and from the variety of sources mentioned, but from puerperal septicæmic patients themselves.

Is Puerperal Fever Contagious?—Medical men who look upon it as a specific fever, or one always arising from a certain poison

which can produce no other disease, of course consider it as contagious, but they who deny its specific nature, and especially those who believe that it is only puerperal septicæmia, are somewhat divided upon the question, at least in *name*, if not in *reality*. For instance, Schroeder remarks: "From all these facts we may conclude that puerperal fever is really not contagious, for by a contagious disease is meant one in which a specific poison is produced within a diseased organism, and which, transferred to other individuals, always produces the same specific disease, such as measles, scarlatina, small-pox, syphilis, etc. Although the secretions of puerperal fever patients transferred to other puerperal women may in them produce puerperal fever, there is nevertheless nothing specific in the secretion. Those secretions have only all the characters of the products of decomposing organic compounds, and the phlegmonous inflammation and the septicæmia which they produce in any wound exactly corresponds to the puerperal fever of puerperal women. If, therefore, puerperal fever cannot be considered contagious in the usual sense of the word, yet it must be admitted that it is manually transferable."

Although Schroeder says that puerperal septicæmia is not contagious, his remarks generally, and particularly the latter half of the last sentence quoted, show that he means that *it is contagious*, in the liberal sense of that word, but *not infectious;* in other words, that it is communicable from the sick to the well by means of contact, or a carrying agent, although not transferable through the air. Some authorities believe that it may be communicated through the atmosphere. The general belief of those who adopt the septicæmic theory is well stated by Leishman, who says that "the doctrine of contagion is, in regard to septicæmic puerperal fever, now almost universally received; but in regard to some of the varieties, and the allied inflammatory affections, the question presents itself for solution under conditions of greater difficulty. We have already expressed our opinion that, although scarlatina may run its course in a woman who has been recently delivered, without the development of any marked symptoms beyond those of the specific fever, such cases very frequently pass into a condition which is identical with puerperal fever. But, beyond this, we are convinced that from the contagion thus developed puerperal fever may be again and again reproduced; and, if we are right in this, the same remark will apply to the other specific fevers." And

further on he continues: "In regard to the cases which may be supposed to be of inflammatory origin, the case is different. A simple inflammation is not communicable; but when a case, at first simple, runs a rapid course, and ends fatally, with the symptoms, let us suppose, of peritonitis and metritis combined, he would be a bold man who would venture to assert that there was no danger. We have never seen any reason to doubt that such a disease is communicable, and we have never been able to discover any *essential* difference between it and the other varieties. There is a general impression, however, that the autogenetic cases, and those which run a mild and more chronic course, are less apt to give rise to contagion than the others. For the practitioner, the only safe rule is to look upon all cases with suspicion, and to adopt the most stringent and careful precautions in every serious inflammatory case, lest he should become the means of carrying death to his patients."

If necessary, abundance of examples of the communicability of puerperal septicæmia might be given in addition to those already mentioned in the first part of this chapter, chiefly, of course, by direct or indirect transference from patient to patient, but probably sometimes through the atmosphere, especially of an illy ventilated hospital crowded with septicæmic cases, where the poison has become concentrated. The non-contagionist is not unlike the town watchman, who, on seeing a little fire kindled by a carelessly thrown cigar, or by some sportive youngster, in dangerous proximity to a building, declines to extinguish or separate it from surrounding combustible material, because he believes that it will not spread. Aided by gentle breezes and dry material, the little blaze spreads quietly on, from house to house, until the deep-toned fire-bells awake the inhabitants from their midnight slumbers to behold the city enveloped in flames.

What is Septic Poison?—We have already stated it to be organic matter in a state of decomposition; but its real essence has not been determined. From the fact of these microscopic animalcula, termed bacteria, being so frequently found in the tissues affected with septicæmia and pyæmia, it has been suggested that they bear a close relationship to the disease, but whether they constitute the active principle of the septic matter, or are simply transferring agents, or accidental spectators, has not been determined.

PATHOLOGY OF PUERPERAL SEPTICÆMIA.—All that we can say upon this point in its present unsettled state is, that there are no constant pathological conditions connected with puerperal septicæmia. Sometimes, indeed, there are no discernible local manifestations of the disease; but, like an invading army, the poison seems to have advanced directly to the citadel of life, and taken it by storm, without any contest in the outward lines of defence. Generally, however, its march may be traced. If the poison has entered at a wound, or an abrasion of any part of the parturient canal, the surface of the solution of continuity becomes covered with a yellowish coat, and its margin swells. The local inflammation spreads from its original focus, until nearly all the vaginal and uterine tissues are affected, and often the peritoneum. The brunt of the diseased action may frequently be seen in the veins and lymphatics radiating from the uterus. Septic matter is readily absorbed by wounds, when fresh, but with difficulty, or not at all, when they are healing; hence, one reason why many puerperal women, who are exposed to the contact of septic matter, do not become affected.

The mucous membranes of the vagina and uterus, when inflamed from the extension of the disease from its original focus, become swollen, and the areolar tissue beneath becomes infiltrated and œdematous, like the skin and subcutaneous tissues in erysipelas. In fact, it is called, by Virchow, malignant internal puerperal erysipelas. If the inflammation is intense, patches of, or the entire, mucous membrane may mortify and slough. If the latter process occurs rapidly, the endometritis assumes a diphtheritic character. Of course, in these severe cases the parenchyma of the uterus becomes more or less affected, and occasionally to such an extent as to constitute metritis, which sometimes ends in softening, and more rarely in perforation of the uterine walls, followed by general peritonitis. The latter, however, is not dependent upon perforation of the uterus, but generally arises either by an extension of the original inflammation, by metastasis, or by blood, poisoned by the septic matter. The general system becomes affected by absorption of the septic material into the uterine sinuses and lymphatics. Or the thrombi, or plugs of the veins and sinuses, opening into the uterus, may become affected by the septic inflammation set up in their vicinity, and send off detached fragments throughout the system, poisoning the blood, and setting

up pyæmic or septicæmic inflammation wherever they may lodge. Of course, it is only the most minute fragments that are able to pass into the arterial system through the pulmonary capillaries, so as to form emboli in the peripheral tissues. If the lodgment of large fragments, increased by accretion, should be in the pulmonary artery, or any of its chief branches, life would be placed in immediate jeopardy from asphyxia.

The venous thrombi, and the lymph at some distance from the uterus, may become impregnated with septic matter through the agency of those minute organisms, called *leucocytes*, which have the power of penetrating the coats of veins and lymphatics. It has already been stated that it is yet unknown what relation these animalculæ bear to septic matter. There is hardly any limit to the metastatic abscesses that may arise in distant parts by these infected emboli. They may form near the joints, or in any tissue or organ of the body. Localized inflammation and abscesses found in various parts of the body may be formed either from the impaction of minute infected emboli, or by the poisoned blood. Those arising shortly after labor, probably result from the latter, while those manifesting themselves several weeks subsequently, are probably due to impacted capillary emboli. The general disturbance set up by the poisoned state of the blood is called septicæmic fever, modified more or less by the various local inflammations, particularly those in the pelvis. The inflammation of the tissues and organs of the latter, is often so prominent as to create a belief, on the part of many observers, that childbed fever is essentially a local inflammation. Hence, we hear of puerperal peritonitis, puerperal hysteritis, puerperal phlebitis, puerperal lymphangitis, etc.

It will be seen from the foregoing sketch, that the pathological changes that may be found in a post-mortem examination are too minute for description in a text-book of midwifery. I must, therefore, epitomize this part of the subject. In those extremely malignant cases, most common in epidemics, where the patient is struck with death within a few hours, or a day or two, from the time of seizure, local pathological changes are rarely present. But the blood becomes dark, thin, and otherwise disorganized. It pours out freely and dangerously from trifling wounds, coagulates imperfectly, or not at all, when drawn from a vein, and helps to

give rise to ecchymoses on the skin, and in the spleen, kidneys, and other organs and tissues.

Local Inflammations.—Besides the local inflammations and abscesses already described as forming in parts of the body distant from the original channel of communication or focus of the poison, it has been noticed that in some epidemics the serous membranes, in others the mucous membranes, in others, again, the veins, and still others the lymphatics, become prominently affected. When the peritoneum has been inflamed, this membrane, after death, will be found more or less extensively congested, and covered with lymph, and the intestines and abdominal organs adherent to one another. The peritoneal cavity, in some cases, will contain serum, which may be pure, or mixed with lymph, pus, and blood. Like changes may be found in the pericardium and pleura, when the membranes have been inflamed. The post-mortem evidences of inflammation of the mucous membranes are very common in the uterus and intestines. These membranes will be found infiltrated and softened, and occasionally detached in patches. Sometimes perforations are seen through the walls of the uterus and intestines, from an extension of the inflammation. As to post-mortem changes in the veins, there is no doubt but that a mere redness of the inner coat, sometimes produced from the coloring matter of the blood; or the presence of pus, which may result from the softening of a thrombus, not produced by phlebitis, but by direct action of septic matter itself, may have been mistaken for inflammation, yet there are numerous examples of genuine inflammation of the veins from the action of septic material, as shown, not only by the presence of lymph and pus, but of contraction, thickening, and absorption of the tissues of the veins themselves.

Symptoms of Puerperal Septicæmia.—In a disease so variable in its pathology as puerperal septicæmia, we would of course anticipate an equal variability in the symptomatology. Were it not for the history of the case, especially its occurrence in a woman shortly after labor, it would often be extremely difficult, and sometimes impossible for the practitioner to diagnose the complaint. It is sometimes, in private practice especially, manifested by such slight phenomena, that we may not at first be able to discriminate it from the ephemeral fever that marks the first appearance of the milk, and in fact it may not be of much longer duration, or of much more serious prognosis. On the other hand, when epidemic

in its asthenic, adynamic, or malignant form, it is sometimes more fatal than the plague, destroying almost every woman attacked, and frequently within a few hours' duration. Generally speaking, it is far more fatal in hospital than in domiciliary practice, and more so during epidemics than ordinary endemics.

Malignant Cases.—The symptoms in these severe malignant cases generally commence within the first two or three days after labor, and are marked by great physical and nervous prostration. There may be a slight preliminary chill, or sometimes a severe one, followed by headache, augmented temperature to about 103° Fahrenheit, feeble and quick pulse, varying from 115 to 145, more or less thirst, a heavily coated tongue, great mental depression, and a partial or complete arrest of the lochia and milk. There is an anxious expression of the face, with sunken and pinched features. The skin may at first be warm, but it becomes cold and covered with a clammy sweat. Occasionally the patient seems to sink at the commencement into a state of collapse, with livid countenance, purple lips, cold sweaty skin, small, almost imperceptible pulse, and haggard, hippocratic features, and expires within a few hours, without any complaint except that of intense prostration. The mental faculties become more or less dull and apathetic, but not generally disturbed in other respects. The urine is high-colored, thick, loaded with lithates, scanty, and occasionally albuminous. Sometimes ecchymosed or purpurous spots manifest themselves upon various parts of the limbs and body. Very frequently there is diarrhœa, the stools being watery and exceedingly offensive. There may be tenderness over the abdomen, with tympanites, but the disease occasionally seems to terminate fatally so soon, that local troubles have no time to manifest themselves. Very often, however, death does not occur under from three days to a week. In the meantime the tongue becomes covered with sordes, the abdomen greatly distended, the mind wandering, with an intermittent or dicrotic pulse, and occasionally a sudden fall in the temperature, particularly just before the final result.

Peritoneal and Uterine Complications.—In many cases of puerperal septicæmia the peritoneum, or uterus, or both are inflamed, when the symptoms are modified by the local inflammation. In these cases there is more warmth of the general surface, and local tenderness and pain over the abdomen, than in the ady-

namic or malignant type. The pain usually first arises in the hypogastrium, more rarely in the epigastrium, but will often spread over the entire abdomen. It possesses all degrees of severity, but is generally not quite so keen as in idiopathic cases of peritonitis and metritis. The abdomen soon becomes swollen at first from flatulence, but subsequently from effusion of serum into the peritoneal cavity, and occasionally augmented by enlargement of the uterus. The patient now assumes a dorsal position, with her thighs flexed, breathes rapidly because her lungs are compressed by the pressure of the diaphragm, forced upwards by the fluid effused into the abdominal cavity, her countenance assumes an anxious, ghastly aspect, the skin becomes cold, the diarrhœa and vomiting which may have begun with the disease continue, the stools and urine being passed involuntarily. The pulse remains frequent, but becomes gradually more feeble and thready, and finally imperceptible. The mind may remain clear to the end, but there is in most cases more or less cloudiness of the intellect, and occasionally muttering delirium supervenes prior to the fatal termination. This and in fact all other types of puerperal septicæmia usually commence within two or three days after labor, because infection can as a rule only take place in fresh wounds, and these occur not later than the removal of the placenta. Healing or granulating wounds do not generally allow the absorption of septic matter.

The period of *infection* and that of the *outbreak* of septicæmia, must not be confounded. The former must precede the latter for a short time—the period of incubation being from thirty to forty hours. Infection may occur at the very commencement of parturition, or earlier if the os uteri be very patulous, from laceration of some of the absorbent vessels by the obstetrician's infected finger, but the most common time is during the expulsion of the fœtus through the os and perineum. So it will be seen that as the incubation is only thirty-five or forty hours, septicæmia may occur during labor as well as shortly afterwards, and in rare instances during gestation.

In diagnosing local or secondary inflammations we must depend upon their peculiar symptoms. Pleurisy, for instance, is recognized by its friction murmur and other physical signs, and by sharp pain.

Lobular pneumonia is not so easily made out, for the reason

that the characteristic sputa are absent, but the presence of pain, dyspnœa, dulness and cough, red sputa, and certain auscultatory signs will enable us to diagnose lobar pneumonia. It is difficult to diagnose inflammation of the endocardium, and of the meninges of the brain. In fact the latter is so rare, and functional disturbances of the brain otherwise so common in puerperal women, that a diagnosis ought not to be made unless the presence of paralysis renders it certain. Diseases of the kidneys are easily determined by chemical, physical, and microscopic tests. If blood, albumen, and granular casts are found in the urine of a previously healthy woman, the diagnosis indicates disease of the kidney, but pus and blood alone would not be sufficient evidence, because they might originate in an inflamed bladder. Inflammation of the joints is easily made out by the acute pain and restricted movements.

Prognosis.—It is hardly necessary to say much about the prognosis of puerperal septicæmia, because it has already been stated, that the gravity of the disease depends very much upon the type and complications. In the malignant type when epidemic, and occurring in large lying-in hospitals, the mortality is sometimes appalling. In sporadic cases the danger is much less, particularly in domiciliary practice. The percentage of deaths at different times and places is so variable, that it is impossible to give a correct average. Fatal cases usually terminate in from two to six days, but death may occur within twenty-four hours, or may not for weeks or months, especially in those pyæmic forms of the disease where abscesses are developed in various tissues and organs of the body.

Convalescence.—Recovery is generally very slow, but occasionally very severe cases are convalescent in about five days. We find the most tedious cases of convalescence among those with secondary inflammations and abscesses. The attending physician should be cautious not to be misled by a temporary abatement in the symptoms. If however the temperature falls, and the pulse decreases in frequency for about twenty-four hours, convalescence may be considered as established. Yet even these indications fail in those deceptive cases where local inflammation succeeds local inflammation for several weeks or months. A decided decrease in [illegible]inal pain and distension are commonly favorable; so is [illegible]n of vomiting if not replaced by an exhausting diar-

rhœa. A gradual disappearance of all the serious symptoms, conjoined with a clearing up of the intellectual faculties, and a healthy return of the secretions and appetite, are of course evidences of convalescence.

TREATMENT.—When Dr. Gordon tells us that in the epidemic at Aberdeen in 1789 he cured all his cases, when he bled early and heroically, and lost them all when he bled late or timidly; and other physicians of as good standing state that Dr. Gordon's treatment was not only a failure, but exceedingly fatal in subsequent epidemics, and that stimulants and tonics were always successful; and Dr. Butter, of Derbyshire, writes that he cured all his patients with ten grains of rhubarb and ten grains of cordial confection given daily; and William Hunter says, in allusion to epidemic cases, that treat them as you will three out of every four will die, we come to the conclusion that the experience of our forefathers is too conflicting for present use.

General blood-letting as a remedy has been buried long ago, and I have no desire for its resurrection, although we occasionally hear a regret from experienced physicians that it should not be tried in sthenic cases complicated with inflammation of the peritoneum. In these cases local abstraction of blood by leeches to the abdomen is still considered useful by a good many practitioners. No one, however, at the present day advocates either general or local blood-letting in asthenic cases, which are the ones of common occurrence.

A SIMILE BETWEEN THE SOLDIER AND DOCTOR.—Some pin their faith on the administration of enormous doses of the preparations of opium. This plan of treatment originated with Professor Alonzo Clark, of New York, who says that "a woman unaccustomed to the use of opium in health, and who was not intemperate, took the first twenty-six hours, of opium and sulphate of morphia, a quantity equivalent to 106 grains of opium; in the second twenty-four hours she took 472 grains; on the third day, 236 grains; on the fourth day, 120 grains; on the fifth day, 54 grains; on the sixth day, 22 grains; and on the seventh, 8 grains."

Dr. Parry, who quotes the above extract, approvingly remarks: "It is, therefore, apparent that we are to be guided by the effect produced rather than by the quantity of medicine administered."

Dr. Parry's rule, with proper limitations, expresses a correct principle in therapeutics, but seems to be misleading when applied

to the foregoing method of treatment, which appears decidedly too heroic. In fact it involves the same idea carried out by the soldier, who, having loaded his gun with an ordinary charge of powder, found that, owing to the bore of the gun being damp, a large portion of the powder was thereby rendered non-explosive. In order to counterbalance the loss of power thus produced he used a much larger quantity of powder the next time he fired, but as the barrel happened to be dry, all the powder exploded and burst the gun.

The doctor should remember that although his patient's *prima via*, like the soldier's *gun*, may be in an abnormal condition at one time so as to prevent the full effect of his powder, yet it may unexpectedly recover its normal condition so that an augmentation of the powder might prove disastrous.

Opiates.—The preparations of opium, however, in appropriate doses, and under proper indications, are among the most useful drugs we possess for the treatment of puerperal septicæmia. They are beneficial in allaying irritation, restlessness, diarrhœa, and pain, and in producing sleep. For the latter two purposes the hypodermic injection of one of the salts of morphia is often the best mode of administering an active principle of opium.

Motor and Cardiac Depressants.—If some practitioners can succeed by the administration of tincture of veratrum viride and aconite in lowering the pulse of a fever patient a few beats they are supremely happy, even though these violent poisons may sometimes stop the circulation altogether. It is probably true that both the pulse-rate and the temperature may be reduced, at least temporarily, by dangerous doses of these drugs, but it is extremely doubtful whether they thus produce any beneficial effect upon the course of a fever. In my opinion they ought to be discarded from the list of useful remedies, especially in puerperal septicæmia.

Antipyretics.—I am sorry to state that I have not a much more favorable opinion of the extreme measures now-a-days resorted to, to lower the temperature in puerperal septicæmia and other fevers; such as bathing in very cold water, packing in cold, wet sheets, and enormous doses of sulphate of quinine. In fact I disapprove of most of the so-called heroic and specific modes of treatment, as not only useless but dangerous in the extreme.

Emetics and Purgatives.—The free use of emetics and purgatives as highly recommended by a few practitioners seems also

objectionable, except the latter class of remedies in cases of constipation, which is apt to occur when puerperal septicæmia is complicated with peritonitis; even then it should be borne in mind that a diarrhœa is very apt to succeed their use.

TONICS AND ANTISEPTICS.—The different preparations of Peruvian bark, especially the sulphate of its alkaloids,—quinia, quinidia, cinchonia, and cinchonidia,—in moderate doses, and the salicylate of quinine are useful as tonics and antiseptics. Also as tonics only, some of the various preparations of iron, not excluding the long-used tincture of the chloride of iron.

ASTRINGENTS.—When the passages from the bowels become too frequent or copious, they must be somewhat checked or modified by astringents, opiates, antacids, and alteratives. In prominent local inflammations warm fomentations and poultices, anodyne or otherwise, will be found useful. Turpentine stupes and enemata containing some of this drug will occasionally be of service to control the tympanitic distension of the bowels.

ASTRINGENT INJECTIONS.—Antiseptic, vaginal, and uterine injections are useful, especially in cases of auto-infection, or where the lochial discharge is very offensive. For this purpose very dilute solutions of chloride of sodium, carbolic acid, or Condy's fluid, may be found of service. A long nozzle with many perforations, attached to a Davidson family syringe, should be carefully passed through the cervix uteri, and the cavity of the womb very gently washed out once or twice daily. If the os should be closed, though it is not apt to be so soon after labor, so as to prevent the free return of the injection, a nozzle with a double canula should be employed, so as to avoid the danger of forcing the liquid through the Fallopian tubes into the peritoneal cavity, or the lesser evil of its retention in the cavity of the uterus.

STIMULANTS.—Wine, brandy, and whiskey, simply diluted, or variously combined with eggs, milk, or beef-essence may often be found of signal service in sustaining the flagging powers under circumstances of great exhaustion or debility. In a few cases the antipyretic effect of sulphate of quinine in ten or twenty grain doses, or salicylic acid, or salicylate of soda in similar quantities, every morning and evening, may be tried for a short time; but their effects must be carefully watched, particularly those of depression by salicylic acid and its salts. The soothing effects of cold water caps to the head might in cases of great pyrexia be brought into

requisition, and sometimes tepid sponging of the body; but, as said before, no cold baths or cold wet sheets to the general surface.

NOURISHMENT.—Of course the vital powers must be sustained by an abundance of easily assimilated nourishment. In conclusion, it may be said that the disease in its varying complexities must be managed upon general therapeutic principles, as there are no specific remedies for its subjugation.

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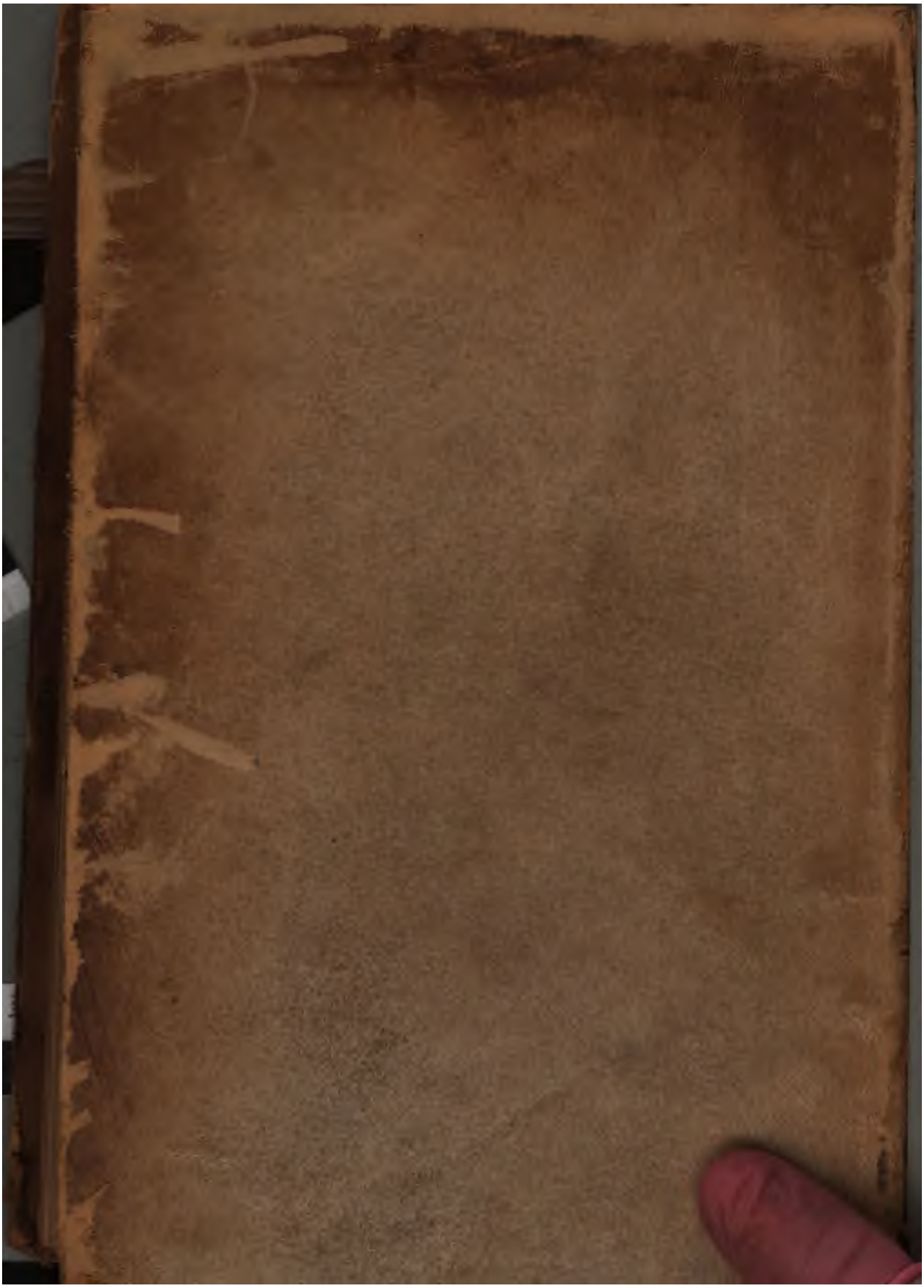
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